“PURSUIT OF THE TORCH”:

INFLUENCES ON ACQUISITION OF USAAF FIGHTER AIRCRAFT USED IN THE NORTH AFRICAN CAMPAIGN

BY

MAURICE AZAR

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APPROVAL

The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

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LT COL JOHN H. DAVIS (Date)

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COL ROBERT EHLERS (Date)

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The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

ABOUT THE AUTHOR

Major Maurice Azar received his commission as a distinguished graduate from Embry-Riddle Aeronautical University in 1995 with a B.S. in Engineering Physics. He earned a master's degree in Operations Research from the Air Force Institute of Technology in 2003 with emphasis in operational modeling, simulation, and applied statistics. Major Azar went on to provide analytical support to Air Mobility Command and Headquarters United States Air Force before completing Air Command and Staff College at Maxwell AFB, AL, in 2009. In summer 2010, Major Azar will be assigned to the headquarters staff, United States Air Forces Europe.

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ABSTRACT

The fleet of pursuit aircraft the US Army Air Forces employed in Operation TORCH and the North African campaign was outmatched, and, much of the time, outnumbered. Air commanders asked pursuit pilots to use their aircraft in roles they were not designed to fulfill against more experienced opponents while executing the combined Anglo-American strategy. This study details the decisions and influences that determined the fleet of pursuit aircraft available to the Americans when they landed in North Africa in November 1942.

The interwar years were crucial in the formation of the force structure with which the United States entered World War II. When taken together, the Great Depression and the American preference for isolationism affected the strength of its armed forces, and the Army's air arm was no exception. Additionally, the rise to prominence of bombardment aviation forced pursuit aviation to compete for resources against an emerging doctrine that some airmen viewed as a means to achieve service independence.

The Air Corps benefitted from the massive rearmament program President Roosevelt launched once he became convinced of America's eventual entry into World War II. However, industry was not prepared for a sudden increase in requirements and could not immediately meet demand with the necessary increase in production. Faced with competing demands between quantity and quality, the Air Corps and industry favored producing older (but mature) designs to suit a defensive national strategy.

Nonetheless, the Army Air Forces found ways to employ their aircraft effectively in the skies over North Africa. They learned lessons about logistics, doctrine, and tactics, and carefully evaluated their equipment's performance against an unfamiliar enemy. Experience from the North African campaign, beginning with Operation TORCH, affected the use of pursuit aircraft for the remainder of World War II.

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Introduction

In 1938…we still didn't understand half of what we should have known about the Luftwaffe.

-General H.H. Arnold, *Global Mission*

Operation TORCH, the Anglo-American invasion of French North Africa, did not mark many World War II firsts, but it offered the Americans in particular an early opportunity to evaluate their airpower capabilities, equipment, and doctrine. The US military was already engaging its Axis adversaries in both the Pacific and European theaters by the time TORCH's 8 November 1942 landings were launched. Nearly a year after the surprise attack at Pearl Harbor, the United States had faced the Japanese in the Coral Sea and at Midway Island. In the European theater, the Eighth Air Force's VIII Bomber Command had already begun strategic bombing operations against German targets in occupied France. What made Operation TORCH unique was its distinction of being the Allies' first opportunity to enact their combined military strategy in World War II. Bringing the collective might of British and American combined forces to bear against the Axis for the first time in North Africa provided valuable experience for American forces, which engaged in combined-arms operations against the Germans. North Africa also offered an opportunity to evaluate US doctrine and equipment against a determined and concentrated enemy.

Before Allied landing craft approached the coast of French Morocco and Algeria, American airpower had accrued several significant achievements. The famed Doolittle Raiders had already bombed Japan, and the Eagle Squadron in England and Claire Chennault's Aviation Volunteer Group in China had already demonstrated American prowess in pursuit aviation. TORCH, however, represented another important

achievement in that it was the first great opportunity for the Army Air Forces (AAF) to conduct broad operations integrating all aspects of its capability, from bombardment to attack to pursuit aviation. Author Horst Boog claims that early operations in the Mediterranean region showcased an approach to air combat more realistic than a reliance on strategic bombing alone to achieve the effects air commanders desired and helped forge relationships amongst the services.[1]

Strategic bombing dominates most images and characterizations of the Army Air Forces in World War II, but the AAF did much more. Although the aspirations of service independence may have rested on the expectations and results of strategic bombing, other airpower missions, including pursuit, contributed to the Allied victory and deserve attention. This research investigates the circumstances and decisions that influenced the production and employment decisions for one particular type of aviation – pursuit – leading up to Operation TORCH and during the North African campaign until May 1943, and why those decisions proved significant for the Allied war effort.

The story of pursuit aviation in Operation TORCH begins as early as World War I, but the most influential circumstances driving the state of pursuit aviation in the AAF in November 1942 are found in political and military leaders' actions taken between World War I and World War II. The North African campaign tested the AAF's doctrine and equipment, serving as a laboratory in which to glean lessons about how to employ pursuit aircraft in subsequent campaigns. This work contains a survey of important events, attitudes, and decisions that affected how the Americans employed pursuit aviation during Operation TORCH. It also provides observations and assessments of pursuit aviation's effectiveness in the North African campaign. The research begins, however, by

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[1] Horst Boog, ed., *Conduct of the Air War in the Second World War* (New York, NY: Berg, 1992) 248.

assessing the condition of the Army's air arm in the years leading up to World War II.

A number of issues influenced the condition and status of the US Army's Air Service—later renamed the Air Corps in 1926 and the AAF in 1941—during the interwar period: post-World War I demobilization, the Great Depression, and a general feeling among most Americans that the Atlantic and Pacific Oceans served as adequate defensive buffers from any potential adversary. As a result, the Air Corps found itself, in the late 1930s, far weaker than desired to achieve its assigned missions. As the world approached another international conflict during the latter half of the 1930s, political and military leaders both recognized the need to expand the armed forces. The decisions about what equipment to provide US and Allied forces were often made based on resources available, industrial capacity and capability, and military requirements. The Air Corps, and later AAF, entered World War II from a disadvantaged position with respect to the merits of some of its equipment. In general, airmen considered American pursuit aircraft inferior to those of their German counterparts at the outset of World War II.

Historians generally recognize that the AAF was infatuated with long range, strategic bombing, and many within its ranks yearned for service independence. Tactical aviation likely suffered while the AAF matured its strategic bombing concepts, but this preoccupation with a favored mission was only one factor in a more complex explanation for the condition of pursuit aviation when the United States entered World War II. Aircraft requirements and the status of the American aircraft industry were more important factors than any sort of neglect in terms of their influence on the state of pursuit aviation in the interwar years.

President Roosevelt favored the air arm as he expanded the military in expectation of the nation's entry into armed conflict. The confluence of his desire to build large numbers of aircraft, the Air Corps' idea of what was needed, and limitations of what could be built quickly

from the existing industrial base, resulted in the air fleet that went to war during the Americans' first 16 months of involvement in World War II. The Air Corps' interpretation of the nation's defensive priorities later left the AAF without an aircraft capable of performing effectively in the traditional pursuit mission of destroying other pursuit aircraft. The industrial base exacerbated preparation issues through the inability to attain desired production levels quickly and the preference for stable aircraft designs to facilitate mass production.

From the initial amphibious landings on the North African coast, the AAF improvised, employing pursuit aircraft in roles they had not been designed to fulfill. Some aircraft, like the P-38, were adept in new roles thanks to their performance advantages over other Allied aircraft and, in certain tactical situations, over their Axis counterparts. Other pursuit aircraft, like the P-40, were used in many roles mostly because they were available in large enough numbers. The AAF use of the P-39 demonstrated the pitfalls in altering specifications and designs in order to rush a design concept into mass production.

This study of events, attitudes, and decisions shaping the AAF pursuit fleet in Operation TORCH begins with a look at the national policies and attitudes shaping ideas about pursuit aviation. Chapter 1 also addresses prevailing Air Corps opinions about pursuit aviation. Chapter 2 surveys how the US Army's air arm expanded from its nadir in the mid-1930s to the air fleet that first took on the *Luftwaffe*. It focuses on the expansion plan as adjusted for production capabilities and the need to arm America's allies, in particular Great Britain and the Soviet Union. Chapter 3 describes the development of the relevant war plans which led to Operation TORCH, the air perspective of the plans to eliminate the Axis presence in North Africa, and details about the pursuit aircraft the AAF took into battle. Chapter 4 examines the execution of Operation TORCH and the North African campaign from the perspective of pursuit aviation and what happened when the United States put its

plan into action. Finally, this study concludes with an assessment of how observations and lessons from Operation TORCH impacted the use of pursuit aviation for the rest of the war and draws parallels to the current situation of fighter aircraft acquisition.

Chapter 1

Policy and Pursuit

The only effective defense against aerial attack is to whip the enemy's air forces in air battles.

-William "Billy" Mitchell, *Winged Defense*

It is doubtful whether [pursuit or observation] operations justify their existence.

-Lt. Col. H. H. Arnold, 1934

A number of factors during the interwar period influenced the state of pursuit aviation in Operation TORCH. The national reluctance to get involved in another war in Europe, combined with a primary interest in the defense of the United States, had a tremendous impact on the condition of the American armed forces. This attitude shaped the Air Corps as much as any organization within the services. As national sentiment changed, the country invested more in the Air Corps, but the Army's air arm had lost valuable time necessary for pursuit aviation development and innovation as the nation slowly and grudgingly changed its mind about whether or not it would become entangled in what would become World War II.

Additionally, the Army Air Corps' evolving perspectives on the role and value of pursuit and bombardment aviation prevented fighter aircraft from reaching their full potential. The Air Corps struggled to define the role of pursuit aviation and find balance between the bombardment and pursuit missions, usually at the expense of pursuit aviation. When the nation's political leaders realized the United States needed to expand the size of the American air arm in preparation for World War II,

development priorities, industrial capacity, and competition for limited resources reduced American pursuit aviation's combat potential.

Immediately following World War I, the United States reverted to its pre-war isolationist tendencies. As the nation pursued a post-war normality, the armed services faced reductions in both manpower and equipment. This reflected a national reluctance to become entangled in overseas crises or to fund its own defense requirements adequately. Many Americans justified their apathy toward the rest of the world by relying on the Atlantic and Pacific oceans to keep any potential adversary at bay, and they could not immediately foresee one in any case.[1] As the grip of the Great Depression tightened, American isolationism grew stronger.

While the American public sought to disengage the nation from the world, the military bureaucracies in the interwar period maintained an outward-looking perspective necessary to justify resources or even their organizational existence as the nation drew down its military. When combined with the country's isolationist and defensive mindset, this increased service sensitivities to any challenges regarding their assigned roles and missions. Billy Mitchell offered the Air Corps enthusiasts a new mission - coastal defense - that could satisfy independent-minded airmen's desire for a raison d'etre to separate from the Army. Mitchell argued in the 1920s that aircraft could economically secure the nation with their ability to range over both land and sea. Airpower could replace both naval patrols and coastal batteries, defense practices squarely in the domain of the US Navy.[2] This aerial coastal defense role offered the Army an opportunity to gain, or at least retain, funds in a fiscally challenging time, but conflict with the Navy was inevitable.

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[1] Mark Watson, US Army in World War II: The War Department; Chief of Staff: Prewar Plans and Preparations. (Washington D.C.: Historical Division, United States Army, 1950) 4.

[2] William Mitchell, *Winged Defense* (Tuscaloosa, AL: The University of Alabama Press, 2009 reprint of 1925 original) 215.

In January 1931, General Douglas MacArthur, Chief of Staff of the Army, and Admiral William Pratt, Chief of Naval Operations, agreed to a distribution of roles for national defense between the two services. Specifically, the MacArthur-Pratt agreement, as it is commonly known, established a role for the Army in coastal defense. As a result of the agreement, however, the Army needed to develop long-range aircraft capable of reconnoitering and striking at an adversary's naval assets threatening the US coast.[3]

The MacArthur-Pratt agreement reinforced the Army's preference for developing and fielding bombardment versus pursuit aviation capabilities. It codified the requirement for a capability demonstrated by Billy Mitchell in the sinking of the *Ostfriesland* and several other naval vessels in 1921. The MacArthur-Pratt claim that an adversary's navy posed the greatest threat to national defense helped forge organizational biases towards a combination of range and offensive power that pursuit aviation could not currently provide.

German and Japanese military conquests in the 1930s raised concerns about potential threats to the United States and its interests. Nazi rearmament, the Anschluss with Austria, and the Munich agreement were especially troubling events to those concerned about the possibility of fighting aggressors intent on encroaching into the American sphere of influence. By 1938, the nation moved from an attitude of passive national defense to a more active role in planning for a broader set of defensive capabilities. In that year, an Air Corps Board study entitled "Air Corps Mission Under the Monroe Doctrine" projected, based on world events at the time, the need to take a hemispherical approach

[3] Wesley Craven and James Lea Cate, *The Army Air Forces in World War* II. Vol. 6, *Men and Planes* (Washington, D.C.: Office of Air Force History, 1983) 5-6.

to national defense.[4] According to this study, and in contrast to the role assigned to it by isolationist policy, the Air Corps would now be responsible for defending against air attacks launched from adversary airfields acquired in the Americas.

Plans for hemispheric defense gained momentum in 1939. Forecasts that adversaries, particularly the Japanese, might attack the Panama Canal fueled the concern. Additionally, US military planners anticipated a need to conduct defensive operations beyond the hemisphere well into the Pacific.[5] American hemispheric defense plans soon focused on denying any potential adversary air bases within the hemisphere.[6] Once again, Air Corps plans emphasized bombardment capabilities while minimizing the role pursuit aviation would play here. This entailed destroying enemy air bases and their aircraft through bombardment while pursuit aircraft provided domestic defense against enemy aircraft.

National attitudes and policy regarding defense evolved as war approached, and they affected ideas about the value and role of pursuit aviation. Consideration of the defense needs of friendly nations was also a contributing factor. US policy toward allies had an impact on the development of pursuit aviation or, more accurately, the lack thereof, and began to leave its mark before the United States made rearmament decisions in 1938. In the early 1930s, the American public refused to offer support to any nation at war. By 1932, the Johnson Act prohibited American loans to any such nation, and the subsequent Neutrality Acts of 1935, 1936, and 1937 severely restricted the export of war material to

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[4] Wesley Craven and James Lea Cate, *The Army Air Forces in World War* II. Vol. 1, *Plans and Early Operations, January 1939 to August 1942* (Washington, D.C.: Office of Air Force History, 1983) 50.

[5] Watson, 88, 95.

[6] Watson, 89.

foreign governments.[7] However, the Air Corps viewed aircraft exports as a way to maintain a viable aviation industry.[8] Nonetheless, through 1937 the Neutrality Acts impeded the Air Corps' ability to leverage the many benefits inherent in developing and producing aircraft for foreign nations. The result, especially from a pursuit aviation standpoint, was a reduction in both the potential for aircraft development and the national capacity to build aircraft.

Ironically, national military and political leaders grew concerned with an increasingly hostile Europe and the potential for United States participation long before national opinion supported any involvement. As early as 12 September 1938, President Roosevelt became concerned about Adolf Hitler. The Führer's speech to the Nuremburg labor union startled Roosevelt, and the President interpreted the Nazi leader's rhetoric as a harbinger of Germany's expansionist designs. Roosevelt believed the United States would inevitably become involved in what would be World War II and held a strong faith in airpower's strategic and operational efficacy. Harry Hopkins, Roosevelt's most influential presidential adviser, recalled that "the President was sure then that we were going to get into war and he believed that air power would win it."[9] After hearing the Nuremburg address, Roosevelt sent Hopkins to assess national aircraft production capabilities.[10] A later chapter addresses the tension between presidential vision and American production capacity.

Reports Roosevelt received from abroad in 1938 strengthened his conviction that the nation needed a strong air force to defend its interests in international affairs. Advisers in both Berlin and Paris warned

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[7] Assistant Chief of Air Staff, Intelligence. *Distribution of Air Materiel to the Allies, 1939-1944: Controls Procedures, and Policies*. (Washington D.C.: Assistant Chief of Air Staff, Historical Division, July 1944) 4.

[8] Assistant Chief of Air Staff, Intelligence, 4.

[9] Craven and Cate, Vol 6., 8.

[10] Wesley Craven and James Lea Cate, *The Army Air Forces in World War* II. Vol. 6, *Men and Planes* (Washington, D.C.: Office of Air Force History, 1983) 8.

Roosevelt in 1938 that a strong German air force and weak ones in both France and Britain were giving Germany greater influence in European affairs.[11] These observations justified Roosevelt's plan to expand the air arm as the nation approached the brink of war, but the Air Corps needed more than an infusion of resources to become the fighting force the president wanted.

State of the Air Corps

Historian Mark Watson characterized the period between World War I and World War II as one of neglect for the Air Corps, which was known as the Air Service until 1926.[12] The Army's air arm was constrained by the firmly rooted US opinion of defensive-only uses of its military and the idea that the Navy should control the oceans and the skies above them.[13] Even after gaining aerial coastal defense responsibilities, the Air Corps remained rather small with little hope of expansion in the midst of the Great Depression. The Air Corps persistently faced small budgets due in no small part to civilian and military leaders' perceptions of the arm's adequacy concerning its ability to perform assigned roles and missions.

Even in the midst of the Great Depression, the Air Corps was actually increasing in strength, although in meager increments. These additions occurred at the expense of other branches of the Army, including Infantry, Artillery, Engineer, and Signal units - a trend that upset other branches and some senior Army leaders.[14] Brig Gen Charles E. Kilbourne, chief of the War Plans Division, related to MacArthur in

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[11] Craven and Cate, Vol 6., 8-9.

[12] Mark Watson, US Army in World War II: The War Department; Chief of Staff: Prewar Plans and Preparations. (Washington D.C.: Historical Division, United States Army, 1950) 4.

[13] Watson, 36.

[14] Watson, 36

1933 that the Air Corps ranked second or third in size in the world while the Army proper was only seventeenth.[15]

Secretary of War George Dern decided to convene a board of senior Army officers and several technology- and air-minded civilians to determine the adequacy of Air Corps equipment in training for peace and war.[16] The Baker Board, a panel reviewing national aviation issues in 1934, declared that the Air Corps in 1934/1935 was as good as any other nation's air force.[17] Perhaps this satisfaction with the state of the Air Corps explains the puny funding it received to maintain an anemic capability. Aircraft purchases were characteristically small during the interwar period with some aircraft contractors competing for purchases as small as six airplanes.[18]

The myth of a proficient and sufficient Army Air Corps touted by the results of the Baker Board also came under fire in 1934. President Roosevelt, suspecting fraud and collusion among airlines holding government contracts to deliver the mail, tasked the Air Corps to take over air mail duties beginning in mid-February 1934.[19] Short of adequately trained pilots and properly equipped airplanes, the Air Corps could not effectively assume the new responsibility, and numerous crashes and deaths occurred.[20] The Air Corps was not organized, trained, and equipped to deliver the mail, and the fiasco was interpreted

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[15] James P. Tate, *The Army and Its Air Corps. Army Policy Toward Aviation: 1919*-1941 (Maxwell AFB, AL: Air University Press, June 1998) 102, 105.
[16] Maurer Maurer, *Aviation in the U.S. Army, 1919-1939* (Washington D.C.: Office of Air Force History, 1987) 315-6.
[17] Martin P. Claussen, *Materiel Research and Development in the Army Air Arm, 1914-1945*. USAF Historical Study 50. Washington D.C.: AAF Historical Office, Headquarters, Army Air Force, November 1946) 25.
[18] H. H. Arnold, *Global Mission* (New York: Hutchinson & Co, 1951) 127.
[19] Tami Davis Biddle, *Rhetoric and Reality In Air Warfare* (Princeton, NJ: Princeton University Press, 2002) 144-5.
[20] Eric Larrabee, *Commander In Chief: Franklin Delano Roosevelt, His Lieutenants, and Their War* (Annapolis, MD: Naval Institute Press, 1987) 213.

widely as evidence of neglect of the Air Corps at the hands of Congress and Air Corps leadership.[21]

An autumn conference in 1938 changed Air Corps fortunes. President Roosevelt, in a meeting with several of his advisers, announced his desire to launch a monumental rearmament effort based mostly on aircraft.[22] Given broader military buildup options, President Roosevelt favored a massive aircraft buildup as the most effective means to quickly field a deterrent against Hitler.[23] The meeting left a strong impression on General Arnold who recalled that the president did not view artillery, barracks, or the retooling of arsenals as an effective means to influence Hitler's decisions about the United States and its allies. Roosevelt was convinced he needed combat aircraft and large numbers of them.[24] After directing a massive national aircraft buildup, President Roosevelt left the Air Corps to determine which aircraft to produce, and contemporary thought on airpower influenced these production mix decisions.

Pursuit versus Bomber

In World War I, airmen considered air superiority was considered a crucial prerequisite to successful air operations.[25] Not only did airmen realize the importance of controlling the air, but ground commanders also recognized that victory on the battlefield required controlling the skies overhead.[26] The British had embraced this observation by strengthening their pursuit aviation arm, more so than reconnaissance

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[21] Robert F. Futrell, *Ideas, Concepts, and Doctrine: Basic Thinking in the United States Air Force* (Maxwell AFB, AL: Air University Press, December 1989) 70.
[22] Watson, 137.
[23] Craven and Cate, Vol. 6, 10.
[24] H. H. Arnold, *Global Mission* (New York: Hutchinson & Co, 1951) 128.
[25] Horst Boog, ed., *Conduct of the Air War in the Second World* War (New York, NY: Berg, 1992) 237.
[26] John H. Morrow, *The Great War In The Air: Military Aviation from 1909 to 1921* (Tuscaloosa, AL: The University of Alabama Press, 1993) 365.

and bombardment.[27] This enabled the British to conduct more aerial offensives and perform ground support activities. These ideas, witnessed in action by a number of American aviators, later influenced the evolution of American doctrine. One observer who saw first-hand how the British fought from the air was Billy Mitchell.

Prior to the US entry into World War I, Mitchell was sent to France to observe Allied airpower. He witnessed the evolution of military aviation missions from primarily reconnaissance to pursuing enemy aircraft to securing friendly troops from an increasingly dangerous adversary.[28] Mitchell learned about the importance of air offensives and pursuit aviation by observing the French and in discussions with the Commander of the Royal Flying Corps in France, Major General Hugh Trenchard.[29] Mitchell's affinity for Trenchard's ideas continued to develop as the British leader and the American aviation visionary shared their ideas about air combat, arming Mitchell with a bevy of thoughts about air organization and operations to take back to the Air Service.[30]

Mitchell believed that achieving air superiority, already important in World War I, required an air force to destroy the opposing air arm.[31] He strongly supported pursuit aviation when he returned to the United States by suggesting that it is the "main fighting line of an air force" and that control of the air depends on it.[32] Mitchell further realized that pursuit aircraft could attack any other aircraft from any side; however,

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[27] Morrow, 363.
[28] Alfred F. Hurley, *Billy Mitchell: Crusader for Airpower* (Bloomington, IN: Indiana University Press, 1964) 24.
[29] Hurley, 25
[30] Hurley, 38
[31] Horst Boog, ed., *Conduct of the Air War in the Second World War* (New York, NY: Berg, 1992) 238.
[32] William Mitchell, *Winged Defense* (Tuscaloosa, AL: The University of Alabama Press, 2009 reprint of 1925 original) 164.

this required superiority in equipment for greater speed and concentrated firepower.[33]

Although Mitchell strongly advocated pursuit aviation, the Air Service focused on his ideas concerning bombardment aviation's offensive potential. Mitchell's ideas in general were not incorporated into the teachings of the influential Air Corps Tactical School (ACTS) until the 1920s and 1930s.[34] Even then, ACTS incorporated his ideas on bombing rather than his overall vision for airpower. As a result, the emphasis on pursuit aviation, which Mitchell intended to instill in the Air Service, was soon placed in a competing position with advocates of bombardment aviation.

Bombardment appeared to offer a compelling alternative to engaging in costly aerial combat with enemy air forces and an organizational incentive in the form of a potentially independent air arm. Each of these developments played a role in reducing the perceived importance of pursuit aviation. The end result was an Air Service preference for bombardment and an associated relative neglect of pursuit.

While officers in the Army Air Service disagreed over whether pursuit or bombardment should be the preeminent mission, they could agree, in the 1920s that the Air Service needed greater autonomy and a higher standing within the service. Bombardment held great promise as the means to deliver the Air Service from the restraints placed upon it by its parent service.[35] Bombardment advocates, in particular, sought to achieve autonomy by highlighting the advantage of attacking targets from the air independent of a ground force.

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[33] Thomas Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* (Maxwell AFB, AL: Historical Division, Air University, June 1953) 37.
[34] Boog, 239.
[35] Biddle, 135

Pursuit aviation's advocacy suffered within the air service as autonomy seekers flocked to the bombardment camp. Chief of the Air Corps Maj. Gen. James E. Fechet raised questions about the utility of pursuit missions in 1929. He directed a conference at Langley to answer to the following questions:

- What are the specific missions of single-seater pursuit?
- Is pursuit more effective than bombardment in destroying enemy aircraft?
- Is pursuit more valuable when used on the special mission of reducing enemy air power or when used to protect bombers and other types?
- Do bombers and attack actually need support as escort?[36]

These questions portended contentious and difficult issues regarding pursuit aviation, such as the value of long-range escort, which the Army would not resolve until well after the United States entered World War II.

Strategic bombing was quickly establishing primacy over pursuit aviation within the Air Corps by the end of the 1920s.[37] Airmen realized that strategic bombing delivered offensive effects that did not have to be coordinated with forces on the land or at sea. Autonomy seekers could therefore use strategic bombing as a rationale for creating an independent organization to employ weapons of the air most effectively. As the desire for organizational autonomy and belief in the promise of strategic bombing became more fervently intertwined, the preference for bombing became a bias which, as of 1931, was without a technology capable of delivering on the promise.

In 1932, the ability to deliver on the promise of strategic bombing appeared to arrive in the form of the Martin B-10. The B-10 was an all-metal monoplane in stark contrast to the Keystone B-3A bomber, the Air

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[36] Greer, 155.
[37] Biddle, 141

Corps standard at the time.[38] In fiscal year 1930, the Air Corps ordered the B-3A, a biplane bomber of wooden construction and top speed just over 100 mph.[39] Over the course of two years, aviation technology had advanced far enough to permit the B-10 to achieve nearly double key performance characteristics of the B-3A such as speed, service ceiling, and payload, providing hope for future bomber capabilities to advance even further.[40] The B-10's importance could also be measured in comparison to speeds of contemporary pursuit aircraft. The B-10 marked a turning point in bomber aircraft technology in which bomber speed matched or exceeded that of pursuit aircraft.

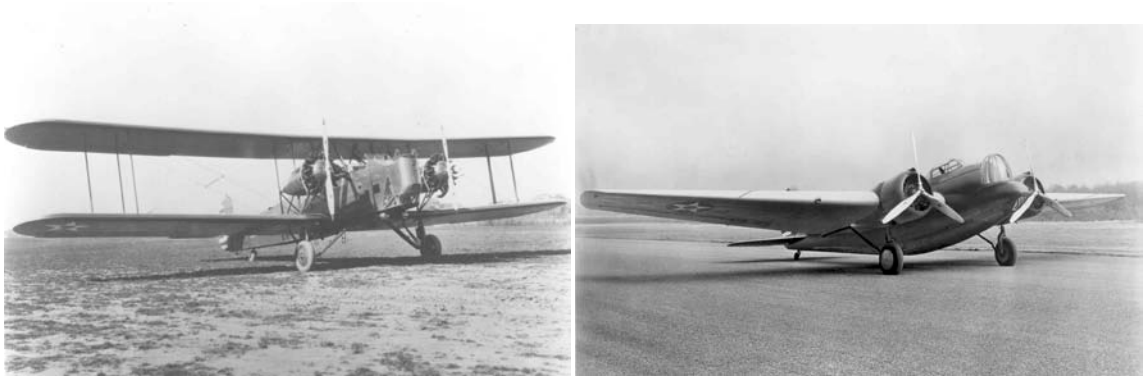

Figure 1: Keystone B-3A and Martin YB-10

(U.S. Air Force Photos)

As bomber technology continued to advance and the quest for air autonomy continued, airmen began to adopt an ever-increasing sense of the survivability of bombers. To demonstrate the ability of bomber formations to reach their targets effectively and to quiet naysayers who questioned the ability of the bombers to do so, the Air Corps conducted a number of exercises. The results of tests in both 1933 and 1934 influenced attitudes about bombardment and pursuit aviation which

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[38] David E. Johnson, *Fast Tanks and Heavy Bombers* (Ithaca, NY: Cornell University Press, 1998) 154.

[39] U.S. Air Force Fact Sheet, "Keystone B-3A."

[40] Johnson, 154. Johnson credits the B-3A with 102 mph max speed, 12,700 ft ceiling, and 2,496 lb bomb load. The B-10 is credited with 207 mph max speed, 21,000 ft ceiling, and 4,380 lb bomb load.

would have an effect for years to come, especially in regard to ideas about the utility of pursuit aircraft.

Ideas about the inability of pursuit aircraft to dispense with enemy bombers appeared as early as 1931. During exercises in that year, an exercise umpire reported that the higher speeds and tremendous amount of space in which a bomber can operate makes it "impossible for fighters to intercept bombers."[41] The same umpire went on to question the need to develop fighter aircraft. While such comments may have been harmful to pursuit aviation, Air Corps leaders did greater damage only two years later when they arrived at the same conclusion.

In 1933, the Air Corps decided to test a new organizational construct called General Headquarters (GHQ) Air Force. Using a provisional GHQ, an exercise was designed to assess the new organization's ability to concentrate air forces on the West Coast to repel an invasion by sea.[42] Assistant Chief of the Air Corps Brig Gen Oscar Westover observed the exercises and reported favorably on the bombers while criticizing the performance of both observation and pursuit aircraft. He remarked that pursuit aviation was "woefully obsolete" in performance characteristics such as speed and questioned the potential to increase the speed of pursuit aircraft enough to intercept enemy bombers.[43]

A different set of exercises in 1934 pitted the standard Air Corps fighter, the P-26, against the B-12, a B-10 modified to carry additional fuel. The results were interpreted similarly to those of the previous year's exercise. Lt Col H. H. Arnold scathingly criticized pursuit aviation, declaring that pursuit aircraft with even a 50 mph speed advantage had little chance of intercepting bombers, and that their short range made

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[41] Bernard Boylan, *Development of the Long Range Escort Fighter*. (Maxwell AFB, AL: USAF Historical Division, Air University, 1955) 12-13.

[42] Craven and Cate, Vol. 1, 64.

[43] Craven and Cate, Vol. 1, 65.

the escort of friendly bombers impractical.[44] He went on to question whether pursuit operations, given their current state, could even justify their existence. General Foulois, then Chief of the Air Corps, added to these criticisms in a speech to the Army War College, stating that other forms of aviation had been more effective at advancing their operating speeds.[45] Arnold's and Foulois' opinions indicate that the Air Corps was unwilling to increase its investment in pursuit aviation improvements to rectify perceived shortcomings, and each saw greater potential in bombardment aviation.

The preeminence of the bomber in Air Corps thinking did not, however, mean an end to thought regarding pursuit aviation, evidenced by the fact that the results of the 1933 and 1934 exercises were not unanimously accepted as resounding victories for bombardment aviation. Capt Claire Chennault, a pursuit aviation instructor at ACTS, was a prominent and vocal critic about pursuit aviation's treatment within the Air Corps. Chennault believed the Air Corps learned flawed lessons from the bomber and interceptor tests.[46] He posited that pursuit aircraft's shortfalls in the test could largely be attributed to difficulties in intercepting bombers, a situation he could remedy with the creation of an adequate warning system.[47]

Chennault did not discount the role of bombardment aviation but understood that the underlying assumption for its success was the ability to "employ, without opposition, a vast number of bombardment airplanes."[48] Clearly, the presence of capable pursuit aircraft in a contested airspace could challenge this assumption, and Chennault sought to expose this fact. He argued that the 1933 and 1934 tests did

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[44] Boylan, 13.
[45] Biddle, 168.
[46] Biddle, 169.
[47] (I) Robert F. Futrell, *Ideas, Concepts, and Doctrine: Basic Thinking in the United States Air Force* (Maxwell AFB, AL: Air University Press, December 1989) 82 (II) Biddle, 169.
[48] Johnson, 157.

less to demonstrate bomber invulnerability than highlight the need to advance the state of the art for pursuit aircraft.[49]

In Feb 1937, the idea behind the use of pursuit aircraft to attain control of the skies took a positive turn. The Air Corps Board, a bureaucratic body responsible for Air Corps requirements, opined that while the most efficient means of neutralizing enemy air was to destroy the bases which supported them, there was a need to defend against enemy aircraft.[50] The Air Corps Board determined that an interceptor would be useful for such a mission. The Board went on to suggest the inclusion of cannon on interceptor aircraft and a speed rating at least 20 percent greater than adversary bombers.[51] Strangely enough, the speed advantage suggested by the Board was very close to that exhibited by the P-26 compared to the B-12 in the 1934 exercise which concluded with such harsh criticism of pursuit performance.

In response to perceived German and Japanese threats in the late 1930s, the nation began to build up its forces. As the country came closer to war, the Air Corps solidified its views about pursuit aviation. In 1940, the Air Corps Board reiterated its belief in the defensive nature of pursuit aircraft by recommending the development of a fighter-interceptor primarily for local defense.[52] The Board further denied a role for pursuit in escort missions by suggesting that the only feasible alternative to support bomber infiltration into hostile territory would be another bomber armed for defensive purposes.[53] The Air Corps Board's narrow view of pursuit aviation resulted in recommendations that reversed the ideas about pursuit aviation developed in the skies during World War I. Pursuit aviation was now formally relegated to a role of

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[49] Biddle, 169.
[50] Futrell, 82.
[51] Futrell, 82.
[52] Futrell, 97-8.
[53] Futrell, 98.

local defense while the task of achieving air superiority would be placed on the wings of bombers.[54]

The Air Corps codified its view on pursuit aviation in April 1940. Field Manual 1-5, "Employment of the Aviation of the Army", indicated that bombardment aviation would conduct strategic operations to "nullify the enemy's war effort or to defeat important elements of the hostile military forces," the latter including an enemy's air forces.[55] Regarding pursuit aviation, the manual instructed that it would defend important locations as well as protect other aircraft in flight, preserving the possibility for defensive air missions when technology made it feasible. Air Corps doctrine anticipated that range would be pursuit aviation's greatest limitation, so Field Manual 1-5 projected the need to base pursuit aircraft further forward than other types.[56] Field Manual 1-5 epitomized a duality of thought in the Air Corps regarding bombardment aviation. Pursuit aircraft were to be dedicated to stopping enemy bombers, yet our own bombers were considered to be unstoppable.[57] The logic used to rationalize bomber primacy led the Air Corps to undervalue pursuit aviation.

The national sentiment for isolationism affected all of the armed services in the interwar years, but the effects were more pronounced in the Air Corps. The specialization of aircraft by their mission (e.g. pursuit, bombardment, etc.) left the makeup of the Air Corps force structure highly susceptible to national policy. A defensive-minded nation could be satisfied with short-range defensive aircraft and look to bombardment aviation to keep the enemy from its shores. As bomber advocates increasingly perceived bombardment as a rationale for

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[54] Futrell, 110.

[55] Futrell, 96.

[56] Futrell, 96

[57] Allan R. Millett, "Patterns of Military Innovation." In *Military Innovation in the Interwar Period* edited by Williamson Murray and Allan R. Millett, 329-368. (New York, NY: Cambridge University Press, 1998) 341.

independence, the attitude of the Air Corps changed from balanced to biased. The result was a tension between bomber and pursuit aviation which would hinder the development of fighter aircraft in the critical years before World War II.

The struggle to keep pursuit aviation relevant was not only fought in policy and doctrine but in the acquisition process as well. The nation determined years before World War II how it would react when war did come. Requirements for aircraft during the buildup to the war would increase as the threat of conflict became clearer. A key concern was how aircraft acquisition, particularly the aircraft industry, would respond to the ever more urgent and increasing need for aircraft. The acquisition process and circumstances did as much to affect the fleet of pursuit aircraft used in Operation TORCH as interwar national policy.

Chapter 2

From Sidelines to Frontlines: Forging the Aviation Sword

> *A new regiment of field artillery, or new barracks at an Army post in Wyoming, or new machine tools in an ordnance arsenal, [President Roosevelt] said sharply, would not scare Hitler one blankety-blank-blank bit! What [the president] wanted was aeroplanes!*
>
> - General H. H. Arnold, *Global Mission*

The pursuit aviation fleet the United States took to North Africa was not a serendipitous outcome disconnected from the problems relating to imminent hostilities, but rather the result of deliberate actions. The blueprint for a buildup came from several high-level reviews of air policy and received a major push from the alarming events in Europe during the late 1930s. Political leaders made the decision to arm for war very rapidly, but industry was not prepared. At times, Americans valued the ability to produce in quantity more than they did the potential for developing the right kinds of high-quality weapon systems. The competition for limited production was fierce. Decisions to dedicate aircraft production resources, and the arguments leading up to them, revolved around the types of aircraft to be built, what proportion of production each service would get, and how much of the nation's total production should be sold, lent, or otherwise allocated to allies, including Great Britain and the Soviet Union once they found themselves at war with Nazi Germany.

The challenges the United States Army Air Corps faced in building up its strength in anticipation of combat action in World War II are not surprising based on the unfounded faith that political and military leaders had in the civilian aircraft industry. The road to building up sufficient forces to challenge the Axis Powers in the late 1930s and early 1940s was long, characterized by inertia, influenced by a profoundly defensive-minded national security policy, and influenced by important board reviews and directives.

Board Influences

A series of important boards focusing on aviation issues set the stage for how the Air Corps would posture in peacetime and how it would be armed in times of war. These boards usually offered an assessment of the Air Corps' capability to match each convening authority's stated expectations and requirements. Their aggregate, long-term effect was a de facto acquisition plan which would hinder the stewardship of pursuit aviation and set the stage for industrial difficulties in preparing for war.

The first such influential review came from the Lassiter Board. In 1922, the Chief of the Air Service, Maj Gen Patrick, submitted his 1922 annual report to Secretary of War John W. Weeks. It concluded that the Air Service had fewer bombardment and pursuit groups than needed in order to meet the requirements for national defense.[1] Secretary Weeks reviewed Patrick's report and another of his follow-up plans and directed Maj Gen William Lassiter, Assistant Chief of Staff, G-3 (Operations and Training), to convene a board to study Patrick's plan.[2]

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[1] David E. Johnson, *Fast Tanks and Heavy Bombers* (Ithaca, NY: Cornell University Press, 1998) 85.

[2] (I) Johnson, 84 (II) Maurer Maurer, *Aviation in the U.S. Army, 1919-1939* (Washington D.C.: Office of Air Force History, 1987) 72.

The Lassiter Board began deliberating in March 1923 "to determine the proper strength and organization of the Air Service."[3] General Patrick was called before the board, and he outlined a 10-year plan to elevate the strength of the Air Service to 1,680 airplanes.[4] The committee concurred with General Patrick's requirement to strengthen the Air Service, questioned the Air Service's ability, at its current strength levels, to perform adequately in the event of a national emergency, and called for legislation to build up the peacetime Air Service.[5]

While little came of the Lassiter Board initially, the committee's report documented the perceived inadequacy of the Air Corps' strength. The board's recommendations, however, were not submitted to its Congressional audience due to bureaucratic hang-ups in upper echelons of the War Department, which did not support the board's recommendations.

Partially in response to the War Department's inaction, Congress convened the Lampert Committee. Tasked with investigating the Air Service, the committee chastised the War Department for not forwarding the Lassiter Board's findings and conducted its own review of Air Service requirements.[6] President Coolidge, perhaps attempting to limit the impact of the soon-to-be-published Lampert Committee's findings, decided to seat his own committee, which would build on the work of the Lassiter Board but carry greater influence on national aviation policy and industry.[7]

The President's Aircraft Board of 1925, known as the Morrow Board after its chairman Dwight W. Morrow, was convened to consider

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[3] Baker Board, 4.
[4] Maurer, 72.
[5] Maurer, 72.
[6] Johnson, 86.
[7] Johnson, 87.

aircraft development and the role of airpower in national defense.[8] Its main task was to recommend the military air policy of the United States.[9] Budgetary constraints, the need to base aviation policy on US military policy, and consideration of potential adversaries' air strength guided the board's perspectives.[10]

The Morrow Board defined the national military policy as being defensive in nature and suggested the Air Service should be sized accordingly.[11] The board's comparison of air strength, considered only in numbers, deemed the Army Air Service's size to be roughly equivalent to that of foreign services.[12] However, concerns expressed in testimony about the obsolescence of Air Service aircraft prompted the board to emphasize that "the term 'obsolescent' may be applied to any type of plane…as soon as it has been put in service." In other words, they felt that based on continuous improvements and upgraded designs, and in a national emergency, all planes, including those considered obsolete, would be of value.[13]

The board obviously did not fully embrace criticism about the quality of the Air Service's current fleet. By casting aside discussions about obsolescence, board members boosted their assessment of the most influential factor of an air arm's strength – numbers. The Morrow Board, in essence, sought to quell alarm bells sounding in the Air Service and Congress about an inadequate air arm and to create an air of sufficiency to remove budgetary pressures from expansion or recapitalization.

Further, the Morrow Board viewed civil aviation as a way to sustain the aircraft industry but realized that production for the armed

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[8] Morrow Board, 1.
[9] Morrow Board, 10.
[10] Morrow Board, 10.
[11] Morrow Board, 10.
[12] Morrow Board, a2-4.
[13] Morrow Board, 11, 17-18.

services would likely dominate the industry for some time to come. Board members warned that air arms should be sized to meet the requirements of national defense and not simply to build aircraft for industry's sake.[14] The board further recommended enhancing industry by suggesting consistent order quantities to avoid production spikes and scarcities, constant rates of aircraft replacement, rewards in the form of production contracts for those companies maintaining adequate design staffs, and government-subsidized orders for experimental designs.[15]

The attempt to provide steady production requirements for industry and avoid an aggressive Air Service posture suggests the Morrow Board was disinclined to propose an increase in the air arm's strength. The favorable comparison to foreign air services connotes that board members felt present strength was sufficient. In general, the board recognized Air Service strength of 1,396 planes of which 396 were considered standard, with the balance being of "somewhat earlier type, but which could be used in war times."[16] Several witnesses testified contrary to the board's assessment of the quality of the airplanes with one witness claiming that of the 1,396 planes in the Air Service inventory, only 34 were "good."[17]

President Calvin Coolidge accepted the Morrow Board report since it supported his efforts to achieve economy in government, but the Lampert Committee soon released its findings, which more closely aligned with the ideas of the Lassiter Board.[18] A period of conflict resulted between Congress, the president, and the War Department, which all parties ultimately had to resolve by compromise. In fact, the Air Corps Act of 1926, which resulted from the findings of the Morrow

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[14] Morrow Board, 29.
[15] Morrow Board, 29.
[16] Morrow Board, a1. The report defines "standard" airplanes as those of the latest type
[17] Morrow Board, 3.
[18] James P. Tate, *The Army and Its Air Corps. Army Policy Toward Aviation: 1919-1941* (Maxwell AFB, AL: Air University Press, June 1998) 45-47.

Board, helped resolve the conflict, changing the name of the Air Service to the Air Corps, but, more importantly altering the air arm's requirements and acquisition process, establishing a five-year aircraft development program and recommending an Air Corps equipment strength of 1,800 aircraft.[19] However, the Air Corps' lukewarm victory was short-lived. For while Congress proposed five annual increases to Air Corps strength beginning in 1926, it failed to appropriate adequate funds to make possible these increases.[20]

Nonetheless, the Air Corps justified its submission of end strength, which was far greater than the 1,800 aircraft recommended in the Air Corps Act, by stressing its defensive role in national security. The War Department and General Staff were not enamored with Air Corps estimates of required strength, which placed too great a share of the responsibilities for defense on the Air Corps, resulting in larger strength requirements. For example, at one point, the Air Corps claimed a requirement for a continuous line of observation aircraft to fly 250 to 300 miles beyond the coast, even though the Navy patrolled and was responsible for this area.[21]

Weary of inflated Air Corps strength estimates, MacArthur tasked his deputy chief of staff, Maj Gen Hugh Drum, "to review and revise the air plans for the defense of the United States."[22] Drum's review concluded that 2,072 aircraft were required, but 1,800 aircraft could provide sufficient protection with an acceptable level of risk.[23] MacArthur tasked the Drum Board to review air defense, but board members seemed more concerned about preserving ground troop strength, since previous expansions of the air arm had come at other

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[19] Tate, 47, 136.
[20] Baker Board, 6.
[21] Tate, 137.
[22] (I) Tate, 138 for rationale about the creation of the Drum Board (II) Baker Board, 5 for the purpose of the creation of the Drum Board.
[23] Tate, 139.

branches' expense. Evidence for this is found in the board's final report declaring that, "the War Department should take no action and Congress make no appropriations toward carrying out the recommendations contained herein for any increase in the Air Corps over 1,800 serviceable planes which will be at the expense of other arms and branches of the military establishment."[24] Limitations such as these made it even harder for the Air Corps to build up an adequate force structure and detracted from its ability to conduct and capitalize on technological advancements.

The earlier Lampert Committee findings did not represent the only instance in which Congress influenced the Air Corps' strength and organization. The Air Corps Act advanced the Army's air arm along its road to independence but stopped far short of granting it. Airmen continued to seek Congressional influence in their bid for autonomy and support in strengthening the air arm. This practice came to a head with members of the War Department in 1934 and resulted in another influential board that helped set the course for pursuit aviation in the Air Corps.

Secretary of War George Dern, irked by a number of Congressional hearings on resolutions regarding more radical changes in Air Corps policy in 1934, and by the perception of neglect of the Air Corps fed by the Air Corps' inability to fly the mail effectively, created a board to review military aviation.[25] The board, whose members included James H. "Jimmy" Doolittle and Hugh Drum, the Army's Deputy Chief of Staff, was chaired by former Secretary of War Newton D. Baker and was given a mandate by Secretary Dern to determine "whether we have a good air force or not" and, if "deficient in equipment, personnel, or training," to provide "your best judgment as to what should be done."[26]

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[24] Tate, 139-40.
[25] Tate, 142-4.
[26] Tate, 144.

The Baker Board, as it came to be known, surveyed the development of the Army's air arm and borrowed heavily from the results of the Morrow Board. One similarity between the Morrow and Baker Board findings was their attempts to disarm War Department opponents. For example, the Baker Board's final report said fears of American civil and military aviation arms being inferior to the rest of the world were unfounded, though it did concede that Army aviation lagged behind that of the Navy.[27]

Likewise, the two boards assumed an enemy attacking the United States by air would employ similar operational concepts. The Baker Board reiterated a Morrow Board opinion that an attack on the American homeland from the air with sufficient numbers of aircraft to threaten security could only be brought about in conjunction with a sizable land or sea force, which would almost certainly face defeat at the hands of similar American forces.[28] The effect of such a statement removed the urgency to advance pursuit aviation technology and opened the door to keeping a shorter-range defensive role for pursuit aircraft.

The board report also addressed Air Corps strength and the technological and operational status of its aircraft. In a statement tying military aviation success to industrial participation, the board opined, "Military aviation in time of war must rely largely upon airplanes built in time of war."[29] Countering those who suggested purchasing more and more updated aircraft, the board, concerned with aircraft obsolescence, actually recommended reducing the strength of the Air Corps during the ensuing peace.[30] If war began, the board thought, industry would provide technologically advanced aircraft in sufficient quantities.[31]

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[27] Baker Board, 9-10.
[28] Baker Board, 15.
[29] Baker Board, 19.
[30] Baker Board, 19.
[31] Baker Board, 19.

The final report set forth the War Department's aircraft acquisition strategy in times of national emergency in three stages:

- Reliance on facilities and equipment existing at the outbreak of war,
- Expansion of existing industry and increased delivery rates, and
- Drawing in automobile and other industries which could effectively augment aircraft production.[32]

The board also proposed peacetime actions to maintain the industrial base with annual aircraft orders and additional incentives for continuing research and development through orders of prototype aircraft.[33]

In terms of recommended strength, the Air Corps could take some solace from the Baker Board report since it concurred with the Drum Board requirement for 2,072 operational aircraft and in fact recommended an actual inventory, including reserve airframes, of 2,320, so the required number of airframes would be available at any time.[34] But recommending aircraft production and building aircraft are two different activities with different participants. The capacity to produce did not always match the stated requirements.

Requirements Crescendo

The Baker Board recommendations were modest compared to Air Corps' desires, but regardless of production goals, the industrial base was simply unprepared to deliver the quantities of aircraft desired.[35] While Congressional approval of the Baker Board recommendations in 1936 resulted in a requirement to expand end strength from the Air Corps Act recommendation of 1,800 aircraft to 2,320 aircraft, the Air

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[32] Baker Board, 19.

[33] Baker Board, 20.

[34] Tate, 145.

[35] Mark Watson, US Army in World War II: The War Department; Chief of Staff: Prewar Plans and Preparations. (Washington D.C.: Historical Division, United States Army, 1950) 124-132.

Corps as late as 1938 only possessed 1,600 aircraft.[36] Of these, the Air Corps assessed that only 1,250 were modern. The Air Corps contracted for an additional production order of 1,000 aircraft, but the production rate was estimated to be only 88 aircraft per month.[37] Production clearly lagged domestic defense requirements, a situation President Roosevelt likely realized in the waning months of 1938.

President Roosevelt kept a very close eye on the events unfolding in Europe and the Pacific in the 1930s. He considered the sinking of a US Navy gunboat by Japan in 1937 and the Nazi Anschluss with Austria in the spring of 1938 as evidence that the world was heading for a war in which the United States must, at some point, become involved.[38] A turning point in Roosevelt's thinking likely occurred on 12 September 1938 as he listened to Hitler's Nuremberg speech and evaluated the rhetoric as a portent for an invasion of Czechoslovakia.[39]

Soon after this, Roosevelt tasked Secretary of Commerce Harry Hopkins to assess the capacity of aircraft manufacturers on the West Coast to produce military airplanes.[40] The directed visit is evidence that Roosevelt placed great faith in the role of airpower. Harry Hopkins recalled, "The President was sure we were going to get into the war and he believed that air power would win it."[41] Hopkins' survey would influence presidential decisions about the level of national effort that could be placed in aircraft production.

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[36] Wesley Craven and James Lea Cate, *The Army Air Forces in World War* II. Vol. 6, *Men and Planes* (Washington, D.C.: Office of Air Force History, 1983) 7-8 and Watson, 124-132.

[37] Craven and Cate Vol. 6, 7-8.

[38] Henry H. Adams, *Harry Hopkins*. (New York, NY: G. P. Putnam's Sons, 1977) 139.

[39] Adams, 139.

[40] Eric Larrabee, *Commander In Chief: Franklin Delano Roosevelt, His Lieutenants, and Their War* (Annapolis, MD: Naval Institute Press, 1987) 211.

[41] Larrabee, 211.

Hopkins returned to report an estimated industrial capacity of 2,600 planes a year.[42] Acting on Hopkins' findings, Roosevelt directed an increase in the number of Army and Navy aircraft to 8,000. This, however, was not the last time Roosevelt translated his interpretation of world events into an increase in aircraft production.

Roosevelt viewed the outcome of the Munich Conference in September 1938 as another indication of Hitler's plans to dominate Europe. British Prime Minister Neville Chamberlain and French Premier Edouard Daladier, along with Mussolini and Hitler, agreed to divide Czechoslovakia, opening the door for Hitler to acquire a portion of Czechoslovakia and causing Roosevelt greater concern about the future of peace in Europe.[43] This development, coupled with reports in October 1938 from the American Ambassador to France, William C. Bullitt, about the strength of Germany's air arm, prompted Roosevelt to further develop national strategies to counter the German threat.[44] With the belief that German air strength provided an overwhelming ability to influence the terms at Munich, Roosevelt planned to invest more in American airpower to give him the same kinds of coercive options.

On 14 November 1938, Roosevelt met with his advisers and military chiefs. He provided his assessment of the European powers' capabilities to produce combat aircraft and communicated his desire for American aircraft production.[45] He expressed the desire for an Army air arm of 20,000 planes with an annual production of 24,000, but he suspected Congress would grant only half the request. To win Congressional approval, he suggested focusing on a program that

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[42] Adams, 140.

[43] Adams, 141.

[44] David E. Johnson, *Fast Tanks and Heavy Bombers* (Ithaca, NY: Cornell University Press, 1998) 167.

[45] Watson, 137. Roosevelt assessed that France had 600 modern aircraft and the capacity to build 3,600/yr, England had 1,500-2,000 aircraft with ability to produce 4,800/yr, Germany had 5-10,000 aircraft with ability to produce 2,400/yr.

Congress would view as feasible, as opposed to pushing to achieve his expressed objective.

The result of the meeting was direction for the War Department to develop a procurement plan for 10,000 planes, of which 3,750 would be line combat, an additional 3,750 to be combat reserve, and 2,500 training aircraft.[46] Roosevelt clearly intended for airpower to carry a large share of the burden for national defense and act as a deterrent against Hitler.[47] The 14 November 1938 meeting and its results are considered to be the beginning of United States rearmament for World War II.[48] This observation led one of the meeting's attendees, Gen Arnold, to record the president's words: "A new regiment of field artillery, or new barracks at an Army post in Wyoming, or new machine tools in an ordnance arsenal, [President Roosevelt] said sharply, would not scare Hitler one blankety-blank-blank bit! What [the president] wanted was aeroplanes!"[49]

While Arnold was thrilled with the president's emphasis on airpower, he harbored no illusions about the challenges he faced as the newly named Chief of the Air Corps. Shortly after his appointment, Arnold saw a clear need for aircraft companies to reconsider production techniques to achieve increased output.[50] The president's direction to expand would only exacerbate the impact of aircraft production limitations. Nevertheless, Arnold tasked Lieutenant Colonels Carl Spaatz, Joseph McNarney, and Claude Duncan to draw up a two-year expansion plan that would result in a total procurement of 10,000 aircraft.[51]

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[46] Larrabee, 214.
[47] Craven and Cate, Vol. 6, 10.
[48] Larrabee, 214.
[49] Arnold, 128.
[50] Arnold, 124-126.
[51] Larrabee, 214-5.

Arnold was aware of another challenge to a successful aircraft production effort, namely the need for infrastructure to support additional aircraft as well as personnel and training to facilitate the expansion. These concerns led him to remark that, "the strength of an Air Force cannot be measured in terms of aeroplanes only."[52] The War Department shared Arnold's understanding of the big picture and prepared a plan including fewer combat aircraft but expanded infrastructure, manpower, and training. When Roosevelt received the War Department plan, which shifted a higher proportion of the 10,000 planes to training and other non-combat aircraft, the president re-emphasized his insistence on combat airplanes but allowed concessions in the form of shifting the aircraft types to a more balanced program.[53] In short, a 10,000-plane purchase would not result in the purchase of 10,000 combat aircraft, a number Roosevelt felt he needed in order to influence German decision-making.

Roosevelt was not more specific about the force structure he desired, beyond a blanket statement about a certain number of combat aircraft. The War Department was forced to interpret Roosevelt's guidance and propose a force structure to meet the president's policy goals. Pursuit aircraft were relatively easier and quicker to manufacture than relatively complex bombers, so the War Department could reach Roosevelt's target sooner by purchasing large quantities of pursuit aircraft. The Air Corps, however, viewed pursuit aircraft as defensive weapons and preferred the offensive role bombers could fulfill. They, therefore, resisted purchasing large numbers of pursuit varieties, instead proposing a more balanced force comprised of both bombers and fighters. This balanced force, however, would require a significant investment in bomber development, and the trade-offs between

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[52] Arnold, 129.
[53] Watson, 138-143.

advancing bomber versus pursuit technology took on greater significance.

The need to establish a balanced force was just one more complicating factor in building up a sufficient air fleet to deter or combat threats to the nation. While Roosevelt focused narrowly on the production of aircraft, the War Department realized that the ability to employ these planes required more infrastructure, such as additional training aircraft and the capability and capacity to train pilots.[54] Fiscally constrained by Congress and materially constrained by industrial production limitations, War Department leaders also faced the need to build a complete force, not just a fleet of airframes and engines.

The president's desired aircraft program generated an unprecedented opportunity to increase the strength of America's pursuit aviation fleet, but the need for an air force balanced between combat and training, as well the need for supporting infrastructure greatly attenuated this opportunity. Additionally, pursuit aircraft were but one type of combat aircraft. Heavy, medium, and light bombers and reconnaissance aircraft were also included in the total number of combat aircraft. Considering the ratio of aircraft types delivered to the AAF, pursuit enthusiasts could hope to secure no better than a 65 percent share of a combat fleet.[55] Although the call for a 10,000 aircraft program might initially have encouraged such enthusiasts, a more ominous obstacle would limit these prospects and impact all aircraft types. National production capacity could not yet fulfill national defense requirements.

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[54] Watson, 138-143.

[55] *AAF Statistical Digest: World War II, December 1945, Table 79.* The percentage referenced represents the highest ratio of fighters produced during the delivery periods presented in the digest.

Production Inertia

Several factors affected the nation's ability to build military aircraft, which in turn prevented it from immediately mobilizing its industrial capacity. One may describe the inability to increase aircraft quality and quantity as production inertia. The limited numbers of manufacturers capable of producing military aircraft placed an upper limit on production before other constraining factors emerged. Economic concerns, including Congressional fiscal restraints and manufacturers' capital shortages, also constrained production. Additionally, manufacturers' desires for design stability impacted aircraft production through efforts to minimize the changes to aircraft designs to achieve greater production efficiencies. These factors produced a constrained aircraft production regimen that limited the aircraft fleet available at the outset of World War II.

In general, military aircraft cost more to design and produce than their civil counterparts. Irving Holley attributes the cost disparity to the military demand for higher performance.[56] This demand limited the amount of technology transfer from civil aircraft, resulting in more research and development costs for military aircraft. Subsequently, the push for ever-increasing performance typically resulted in design changes that prevented the aircraft manufacturers from realizing savings typically earned in amortizing costs over long production runs. Altogether, these factors contributed to a capital-intensive undertaking that remained undesirable or posed an insurmountable obstacle to all but a few large manufacturers.[57]

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[56] Irving Holley, Jr, *U.S. Army in World War II, Buying Aircraft: Materiel Procurement for the Army Air Forces* (Washington D.C.: Center of Military History, United States Army, 1989) 20.

[57] Holley, 21.

The manufacturers who decided to build military aircraft sought to do so economically to maintain profitability, for while military aircraft remained the largest portion of aviation market share throughout the 1930s, order quantities prior to the buildup for World War II remained small.[58] By sizing their facilities to maintain a steady flow of work, rather than hedging for spikes in orders, manufacturers had little excess production capacity to dedicate to greater aircraft output.

These manufacturers' attempts to economize their use of resources were inconsistent with the buildup Roosevelt ordered. By its nature, a wartime mobilization program focused on increased output necessarily meant a more wasteful use of resources, rather than a more economical one, to obtain the quantities desired.[59] Such an idea flew in the face of business practices the manufacturers had adopted to weather the lean years of the Great Depression.

Industry was unprepared to scale up its production to the level Roosevelt required. The president of Lockheed stated that "the air industry was called upon to build thousands of something it had only built dozens of before. It was like a youth who is suddenly expected to go to college before he has graduated from grade school."[60]

Economy was not just a concern of the aircraft manufacturers. The economic situation in the United States acted as a buffer to any large-scale changes in production and manifested itself in public and congressional opinion. The majority of Americans throughout the 1930s were against the cost of rearmament as well as the principle of preparing for war, and this was reflected in the highest government echelons, particularly in Congress.[61] While Roosevelt's 14 Nov 1938 White House conference resulted in a plan to ask for 10,000 aircraft, he really desired

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[58] Holley, 20, 27.
[59] Watson, 12.
[60] Gene Gurney, *The P-38 Lightning* (New York, NY: Arco Publishing, 1969) 13.
[61] Watson, 5.

a fleet of 30,000 aircraft but was forced to reduce the number in an attempt to prevent Congress from balking. The chief executive further reduced his request for aircraft and asked only for an additional 3,000 beyond what was already programmed.[62]

Congress was relieved to receive this more moderate figure as some members felt that a request for 15,000 to 20,000 aircraft would bankrupt the nation.[63] Congress eventually approved a program for 5,500 aircraft. Yet even this number would prove a challenge to achieve. In August 1939, Air Corps records indicated 1,178 undelivered aircraft were on order, 1,291 were held up in contract considerations, and 1,143 potential purchases depended on the evaluation of competitions.[64]

Even if production capacity and financial resources had been available, attempts to generate output in quantity placed another limitation on manufacturers. Design changes tended to be more frequent for military aircraft, but industrial practices demanded some level of stability in design. From an operational perspective, a design freeze limited or prohibited the inclusion of new or developing technologies into an existing production run. From a profitability standpoint, design stability helped reduce tooling changes and decreased manufacturing costs by allowing manufacturers to order raw materials in bulk and capitalize on efficiencies learned from having mature processes.[65] The impetus to maintain profitability through stability had a negative effect on aircraft quality.

The long life of aircraft models in the late 1930s compared to earlier eras was due in great measure to the complexity of the machines. Advanced aircraft required more time to design, build, test, and produce. The resultant tendency was to produce an aircraft design until it was

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[62] Holley, 170-1.
[63] Holley, 195.
[64] Holley, 194.
[65] Holley, 512.

obsolete.[66] Wesley Craven and James Lea Cate contend that, as late as 1941, aircraft production still included obsolete models with limited combat utility.[67]

In defense decision-making during the re-armament period, quality was less important than quantity. Decisions to produce aircraft in larger numbers rather than hold out for expectations of improved models in later years were initially the norm.[68] The need for aircraft manufacturers to make production decisions about design staffing, tooling, and manufacturing planning nearly a year in advance incentivized prolonging a design into obsolescence, even in the midst of potential alternatives.[69]

The gap between requirements and production capacity took a turn for the worse in May 1940. The American belief that the French and British could balance Germany's military might evaporated with France's defeat.[70] The United States realized it might have to face Germany alone and adjusted its acquisition plans accordingly. President Roosevelt issued a call for a revised program of 50,000 aircraft on 16 May 1940 just as the War Department had finished its plans to meet the congressionally-approved 5,500 aircraft program.[71] The president's call further separated requirements from realities.

William Knudsen, Roosevelt's pick to assist with issues relating to war production, cautioned the president that his ambitious goal would take several years to achieve. Roosevelt again moderated an unrealistically large estimate to a more reasonable requirement of 18,000 aircraft and wanted industry to achieve the goal by 1 April 1942.[72] The

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[66] Peter Bowers, *Curtiss Aircraft: 1907-1947* (London, England: Putnam & Company Ltd., 1979) 415.
[67] Craven and Cate, Vol. 6, 402.
[68] Craven and Cate, Vol. 6, 228.
[69] Craven and Cate, Vol. 6, 268.
[70] Larrabee, 46-7.
[71] Craven and Cate, Vol. 6, 264.
[72] Craven and Cate, Vol. 6, 265. Additionally, Roosevelt stipulated an annual production of 18,000 aircraft.

Air Corps immediately set out to revise its program to meet the new requirements.

These requirements again expanded far more quickly than production capacity, and Robert Lovett, future Assistant Secretary of War for Air, determined in 1940 that the American aircraft industry was still not capable of meeting production requirements.[73] Two years later, he declared that the unreasonable requirements imposed on industry were counterproductive since they caused manufacturers to produce great numbers of an obsolete model to meet production goals rather than turn out more advanced aircraft, which would burden them with longer production cycles.[74] Eventually, Lovett declared that maintaining a productive capacity is a "truer measure of airpower than the number of planes at a given moment."[75]

Production capacity for aircraft in the rearmament phase remained a limiting factor in both the quantity and quality of aircraft delivered to the Air Corps in advance of World War II. What made the limitations all the more difficult for the Air Corps to accept was the fact that the War Department had to share national production capacity with other weapons such as tanks, other services in the case of aircraft, and even other nations. This wide-ranging allocation of war material placed a great burden on the Air Corps as it sought to field a fighting force.

Allocation Issues

The period before America's entry into World War II was a challenge for resource allocation decision makers. The country faced a number of alternatives with far-reaching implications. One of a number of important decisions on the eve of war was how or whether to dedicate some aircraft production to allied nations while in the midst of a

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[73] Larrabee, 217.
[74] Larrabee, 218.
[75] Craven and Cate, Vol. 6, 268.

domestic military buildup.[76] While many believe Roosevelt's November 1938 conference with his advisers spurred an increase in US defense production, historian Mark Watson maintains that the president's unstated intent was to produce large quantities of aircraft to sell to France and Great Britain.[77] This placed US domestic interests at odds with international concerns.

Sharing aircraft production with allies was not a difficult issue to resolve before the US decision to rearm. In fact, the Air Corps encouraged exports to friendly countries, especially during the closing years of the Great Depression. After the end of World War I, the Air Corps viewed export as a way to keep the domestic aircraft industry viable.[78] With the passage of neutrality acts between 1935 and 1937, which prohibited the sale of war material to belligerent nations, the Air Corps still sought ways to keep export business alive, if only to maintain production capacity until the United States might need it.[79] Ambassador Bullitt's report to Roosevelt in October 1938 did much to change presidential thinking about the roles of and need for aircraft in domestic as well as allied defense. Bullitt convinced Roosevelt of the need to produce arms for Britain and France. He detailed how an Anglo-French alliance would depend on US industry to achieve parity with the assessed size of Hitler's *Luftwaffe*.[80]

Roosevelt wanted to increase aircraft production and envisioned the possibility of building factories specifically for the purpose of arming the Anglo-French alliance. However, prevailing opinion of the law at the time dictated that he could not use government funds to construct

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[76] Watson, 11.
[77] Watson, 138.
[78] USAFHS 106, 4.
[79] USAFHS 106, 5.
[80] Watson, 132-3.

factories that would not primarily be supporting US defense needs.[81] The absence of public opinion to build a stronger military at the time removed the possibility of expanding aircraft production capacity based on the international situation.

The unwillingness to sell arms to belligerent nations constituted a disconnect between reality and national wartime acquisition plans. The Morrow and the Baker Boards advocated the construction of aircraft to supply a wartime air force in the event of a national emergency. However, the short-sighted desire to keep the United States out of war, which resulted in the neutrality acts, left the aircraft industry in the difficult position of generating an ambitious expansion program in short order. As warring nations would likely purchase only state of the art equipment and eschew obsolete machines, industry was left in a quandary. Developing new aircraft could have spurred export sales, but businesses guarded advancing technologies with secrecy, and Congress often prohibited their release to foreign governments.[82] Hence, industry was left without a major incentive to innovate beyond the Air Corps program. The outbreak of war in Europe in September 1939 changed all of this.

Following the German invasion of Poland and the subsequent British and French declarations of war, Roosevelt sought to re-ignite the debate about US support to European nations. On 21 September 1939, he convened a special session of Congress to make his case to allow belligerent nations to buy war materials on a cash-and-carry basis. Roosevelt argued that such a provision would aid the United States in its attempt to avoid entry into war, a fundamental objective the neutrality acts sought to achieve.[83] On 4 November 1939, the Democratic Congress

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[81] Watson, 132-3.

[82] Holley, 196-7

[83] (I) Sean Cashman, *America, Roosevelt, and World War II* (New York, NY: NY University Press, 1989), 39. (II) James Wilford Garner "The United States Neutrality Act of 1937."

voted to allow the sale of war material to belligerent nations on a cash-and-carry basis, in essence lifting the arms embargo imposed by previous neutrality acts.[84]

The Neutrality Act of 1939 made possible the export of arms, but in solving one problem on the road to defeat Germany, the act opened the door to several others. The War Department lodged numerous objections at the highest levels on grounds that became even more valid as the rearmament program progressed. Representing an opposing view to the neutrality legislation and demonstrating his isolationist slant, Secretary of War H. H. Woodring wished to see only surplus material sold to foreign countries and only to neutral countries at that.[85] He also felt that providing arms to other nations would negatively impact the US' ability to build up its forces. Woodring also resented requests by foreign governments for state-of-the-art technologies that were not even in the American inventory yet.[86] Army Chief of Staff George C. Marshall remarked to State Department representatives that it would be ill-advised to leave American forces without weapons in time of need because they had already provided those weapons to a foreign country.

Nonetheless, Roosevelt's intent was not to burden the national capacity but to expand it, making the United States the "arsenal of democracy."[87] As the British Commonwealth, the lone great power

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The American Journal of International Law 31, no. 3 (July 1937), 386-8. Garner explains that cash-and-carry is the practice of purchasing material in America with the purchasing country responsible for transporting the goods. In so doing, the goods would not be attributable to the US in the event of their destruction or capture by the enemy, since the American people would no longer have interest in the goods once the purchase was completed. The Neutrality Act of 1937 had a cash-and-carry provision but allowable purchases were restricted to goods other than arms and ammunition, sales of which to belligerent nations were expressly prohibited in the act.

84 Philip C. Jessup "Neutrality Act of 1939." *The American Journal of International Law* 34, no. 1 (January 1940), 95-6.

85 (I) USAFHS 22, 109. (II) Watson, 303-4.

86 Watson, 304

87 (I)Craven and Cate Vol. 6, 11 (II) Russell Buhite and David Levy, ed., *FDR's Fireside Chats* (Norman, OK: University of Oklahoma Press, 1992) 173. The phrase "arsenal of democracy" was used by FDR in a fireside chat speech to the American public on 29

combating Germany after the fall of France, began to exhaust its financial resources, Roosevelt sought to relax restrictions against supporting US allies. The British plight at the end of 1940 essentially forced the United States to decide either to enter the war outright or to extend credit to Britain, a situation prohibited by the cash-and-carry policy of the Neutrality Act of 1939.[88] Based on its desire to continue supporting the British, Congress passed the Lend-Lease Act.

The Lend-Lease Act of 1941 further opened the gates of US production to the British by allowing the president to "manufacture…or procure…any defense article for the government of any country whose defense the President deems vital to the defense of the United States."[89] Most importantly, the act gave the president the authority to "sell, transfer title to, exchange, lease, lend, or otherwise dispose of" any war material, thus opening up new transaction possibilities above and beyond traditional sales. With the passage of the act, the government decided to allocate 12,000 aircraft to the British over and above the 14,375 agreed upon in an allocation plan drafted in 1940. Further, the British were to receive the first fruits of any new aircraft production capacity until the United States entered the war.[90]

As industry ramped up production, domestic and foreign requests for aircraft continued to grow, resulting in some difficult allocation decisions. Roosevelt was certain some level of coordination for national production was required, and this consideration contributed to his

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Dec 1940. In the same speech, FDR stated that the government and its defense experts would decide the allocation of weapons.

[88] USAFHS 106, 23.

[89] *Public Laws. Part 1* of *United States Statutes at Large Containing the Laws and Concurrent Resolutions Enacted During the First Session of the Seventy-Seventh Congress of the United States of America, 1941-1942, and Treaties, International Agreements Other than Treaties, and Proclamations*. Vol. 55 (Washington: Government Printing Office, 1942): 31-33.

[90] Craven and Cate Vol. 6, 400.

support for a lend-lease arrangement.[91] Coordination was no easy task given the disparate interests of the partners.

As late as 1938, coordination efforts between Great Britain and the United States were tentative and focused on war planning. A meeting between the Chief of the Navy War Plans Department, Capt Royal Ingersoll, and British officials achieved Roosevelt's desired level of coordination through mutual assurances of military access to each others' waters in the event either country found itself at war with Japan. The mood between the two countries was characterized as one in which new troubles were expected to bring additional cooperation.[92] As tentative as such coordination was in war planning, no such agreements existed with regard to aircraft production.

In the intervening years between the world wars, there were nominally three ways for foreign governments to get military aircraft from the United States. One was the direct sale of aircraft designed for the Air Corps to foreign purchasing agents contracting with the manufacturer. In July 1940, a second was opened to the British in the form of releasing domestic production capacity which had previously been dedicated to Air Corps aircraft. Thirdly, as a result of the 1941 Lend-Lease Act, the United States could simply transfer aircraft to foreign governments.[93] The need to coordinate national production increased with each method as the intensity of world conflict and US rearmament increased.

An early instance of the need to coordinate production occurred in 1938 when Air Corps representatives discovered that the British were about to let a contract for aircraft directly to an American manufacturer.[94] For manufacturers, the incentive to export was higher profit margins due to higher prices which could be demanded of foreign

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[91] Watson, 322.
[92] Watson, 93.
[93] USAFHS 106, 1.
[94] USAFHS 106, 10.

governments.[95] However, the Air Corps was concerned that the incentive of higher profits would encourage manufacturers to produce foreign articles first and delay Air Corps production.[96] Air Corps views reflected the dual objectives of maintaining or increasing industrial capacity and protecting their own production plans.

The Air Corps and government restrictions on releasing aircraft designs to foreign governments placed the Air Corps' dual objectives in competition with each other. In the attempt to maintain secrecy and the advantage of American innovations and design, primarily obsolete aircraft were made available for export.[97] While the Air Corps hoped to get the latest models, production orders continued for models immediately available. The cases of P-35 and P-36 production illustrate this situation.

The Curtiss P-36A was approved for release to foreign governments in March 1938. The Seversky P-35 was released in May of the same year. Both aircraft were designed to meet a 1934 Air Corps specification and were contracted for production in June 1936 and July 1937, respectively.[98] As a testament to the limited utility of the airplanes' designs to the Air Corps, no P-35s served in front-line service for the United States in World War II, and the few P-36s in the Air Corps' possession which survived the December 1941 Japanese attacks were soon sent to foreign air services. Yet, the American aircraft industry continued to export both models into 1941.[99]

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[95] Holley, 18.

[96] USAFHS 106, 10.

[97] USAFHS 106, 5-11.

[98] (I) William Green and Gordon Swanborough, *US Army Air Force Fighters, Part 1* (New York, NY: Arco Publishing Co., 1977) 29-30. (II) William Green and Gordon Swanborough, *US Army Air Force Fighters, Part 2* (New York, NY: Arco Publishing Co., 1978) 61.

[99] *Army Air Forces Statistical Digest*, 118-124, 127-132. While the accounting of Tables 76 and 79 do not expressly state the export of P-35s and P-36s, the acceptance of those aircraft in Jan 1941 exceed the number of those aircraft allocated to the AAF for that month.

As the crisis unfolded in Europe, the Air Corps continued to seek advantages in production. In March 1940, the Air Corps deferred the production of some aircraft for its inventory in favor of delivery to the British in order to take advantage of the possibility of receiving later models from the manufacturer.[100] However, the fall of France in June of the same year brought new tension to the production relationship. The United States faced tension between focusing on its own rearmament in anticipation of potentially fighting Germany alone in the future, or of prioritizing British aid in the hope of keeping them in the fight.[101]

As this tension increased, efforts to coordinate scarce aircraft production floundered. The 1940 presidential election played a role in stymieing conversations between US and British staffs due in great part to the claim by both candidates that the United States would not enter the war in Europe.[102] However, in July 1940, Lord Lothian, the British ambassador to Washington, proposed that the United States and Great Britain share scientific information, including information about short-wave radio, an enabling technology for radar.[103] The event served as a turning point in US and British cooperation, and agreements about production soon followed.

Later in July, representatives of the American services and the British Purchasing Commission met and agreed to the allocation and delivery schedule shown in Table 1.[104] This allocation made clear the high priority placed on delivery of aircraft to the British. Especially telling here is the fact that the agreement reflected in the table actually

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[100] Craven and Cate Vol. 6, 398.
[101] Craven and Cate Vol. 6, 399.
[102] Watson, 118-9.
[103] Watson, 316-7.
[104] Craven and Cate Vol. 6, 267.

represented an 8,601 aircraft decrease in the previous Air Corps delivery program.[105]

Table 1: Aircraft Allocation and Delivery Schedule

	30 Jun 1940 -1 Apr 1941	1 Apr 1941 - 1 Oct 1941	1 Oct 1941 - 1 Apr 1942	Total by 1 Apr 1942
Army	6,882	3,548	2,454	12,884
Navy	1,923	1,555	2,730	6,208
British	4,094	4,686	5,595	14,375

Source: Craven and Cate Vol. 6, 267.

Even with allocations established by mutual agreement, conflicts over production continued. The July agreement did not prevent the British from contracting for additional aircraft and resources directly with manufacturers. At one point, manufacturers approached the War Department for the release of aluminum and additional aircraft to the British above and beyond levels established by prior agreement.[106] The requests prompted protests by senior officers who feared the additional contracts threatened timely delivery of their services' aircraft and served as an impetus for a more formal production coordination process.

In September 1940, Secretary of War Stimson directed the formation of the Army-Navy-British Purchasing Commission Joint Committee. The organization's name was later shortened to the Joint Aircraft Committee (JAC), but the committee retained its responsibility to coordinate US and British aircraft requirements.[107] A November 1940 presidential directive to split aircraft production between the United States and Great Britain in equal parts helped simplify the JAC's duties, but it took on a larger role in January 1941 when it was assigned the task of coordinating aircraft production for all foreign governments. By

[105] Craven and Cate Vol. 6, 399.
[106] USAFHS 106, 17.
[107] Craven and Cate Vol. 6, 400.

expanding its responsibilities, the JAC developed an integrated, inclusive production schedule.[108]

Aircraft production coordination efforts continued, with the JAC serving as the main allocation authority for aircraft even after Congress relaxed the Lend-Lease Act's export restrictions. The creation of the Munitions Assignment Board in early 1942 combined American and British production into an inter-allied pool, and the JAC continued in its role of influencing Allied aircraft allocation.[109] While aircraft production increased, allocations changed and other foreign governments' defense requirements, namely the Soviet Union's after the summer of 1941, added to the burden on industrial capacity. Nonetheless, the fundamental mechanisms to coordinate aircraft production were in place beginning in September 1940. The resulting production of American pursuit aircraft after the formation of the JAC and prior to the start of Operation TORCH is shown in Figure 2.

[108] USAFHS 106, 20.
[109] Craven and Cate Vol. 6, 404.

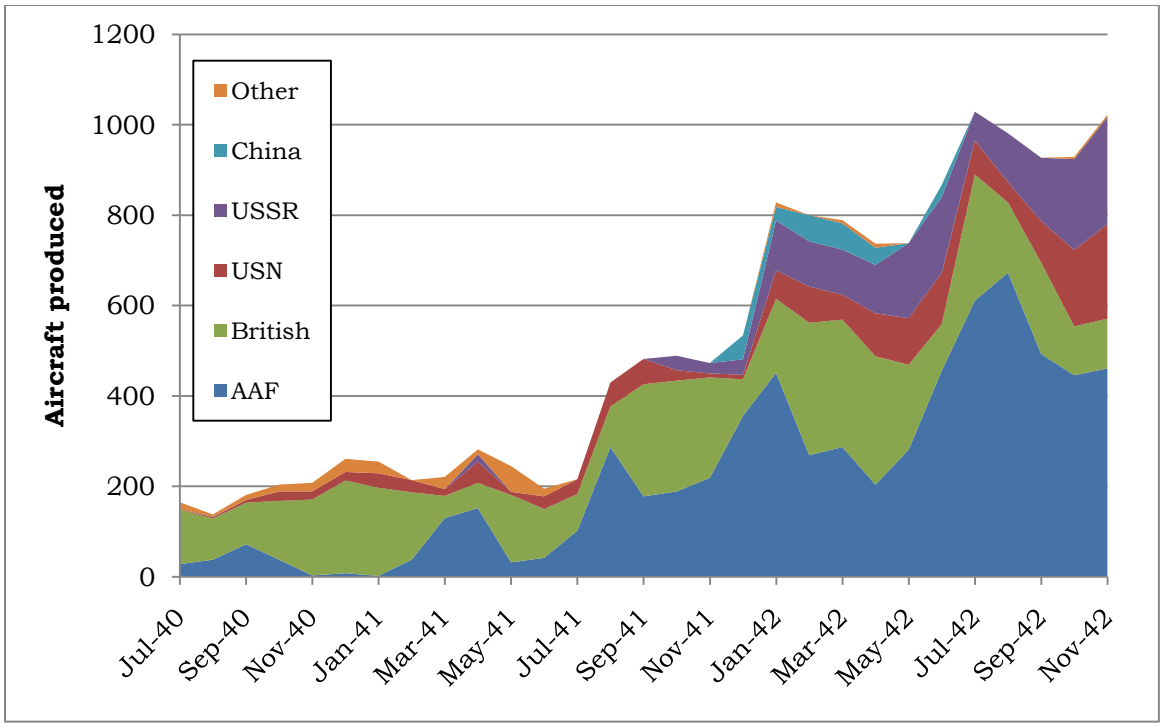

Figure 2: Pursuit Aircraft Allocation (Jul 1940 – Nov 1942)

Adapted from AAF Statistical Digest: World War II, December 1945, Table 76.

Early in the rearmament program, the Air Corps looked favorably on exporting aircraft primarily as a means of maintaining American industrial capacity. The Air Corps benefited from the additional advantages of such arrangements, including the ability to share development costs with foreign governments, access detailed performance data of aircraft sold to foreign services, and increase American leverage in military affairs due to foreign dependence on American arms, and compete.[110] When crises emerged, the Air Corps got more than they bargained for as foreign air forces' dependence exceeded expectations and strained, rather than boosted, industrial capacity.

Figure 2 highlights the difficulties pursuit aviation faced based on industrial capacity. While manufacturers continued to increase the quantities of aircraft produced, industrial capacity and the nation's overall production allocation limited pursuit aircraft manufacture well

[110] USAFHS 106, 5-6.

into 1941. Exacerbating the effects of this limited production was the need to allocate aircraft amongst the numerous organizations requiring them. The British received early priority for American production, but the Air Corps had to share the remaining production with the Navy Bureau of Aeronautics.

An additional drain on pursuit aviation came from within the Air Corps and is not shown in the figure. While overall aircraft production was constrained, the development and production of bombardment aircraft had a higher priority than pursuit aircraft since some Air Corps leaders wanted to emphasize strategic bombing doctrine. The labor- and resource-intensive bomber construction took longer than the process to complete pursuit aircraft, required more industrial space, and consumed more raw materials. Despite placing such demands on American industrial capacity, bomber aircraft at least offered a clear employment concept that fit within emerging American war plans. The same, however, was not necessarily true of pursuit aircraft in the plans for Operation TORCH.

Chapter 3

Of Plans and Planes

How many aircraft a country produced was important, but which aircraft it fielded and how well suited they were to their respective nations' grand strategies was crucial.

- John F. Guilmartin

The strategic plans developed by US military planners in the interwar years strongly influenced, and perhaps even presaged, America's overall military strategy in World War II. The evolution of the plan eventually executed as Operation TORCH provides insight into the expected role of pursuit aviation in joint operations. A cursory study of American pursuit aircraft available for Operation TORCH gives us the opportunity to evaluate the suitability of pursuit aviation for the roles senior military leaders and troops alike expected of it.

During the interwar years, American military personnel identified US war plans by color to represent the expected adversary, with each color representing a single adversary. For example, Joint War Plan Red dealt with war against Great Britain. Joint War Plans Orange and Green were predicated on fighting Japan and Mexico, respectively.[1] These plans were joint only inasmuch as they included input from both the Army and the Navy. The Air Corps, in its attempt to meet expected operational requirements, used these war plans to justify its desired force structure. In 1933, the Air Corps' projections of its required strength raised concern amongst the Army's senior leaders.

MacArthur's January 1933 directive for the Army to conduct land-based air operations to defend the United States and its possessions

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[1] Robert Futrell, *Ideas, Concepts, and Doctrine: Basic Thinking in the United States Air Force* (Maxwell AFB, AL: Air University Press, December 1989), 67.

came two years after the MacArthur-Pratt agreement created an Army role for coastal defense. The Air Corps absorbed the extra responsibilities for coastal defense and in July submitted a plan for using the relatively new idea of an organizational construct called General Headquarters Air Force (GHQAF). This organization was designed to employ its authorized force structure in War Plans Red, Red-Orange, and Green.[2] The Army seated a board to review the Air Corps plan and tapped Maj Gen Hugh A. Drum, deputy to the Chief of Staff, to lead the panel.

The Drum Board used the challenging Joint War Plan Red-Orange to evaluate the plan.[3] The resulting report identified that the greatest threat to national defense from this scenario would come from naval carrier support of British and Japanese troop landings in Canada. Along with recommending the creation of GHQAF, the Drum Board also recommended expanding the Air Corps to 2,320 aircraft organized into 27 bombardment, 17 pursuit, 11 attack, and 20 observation squadrons. The Drum Board's recommendations differed from the Air Corps proposal submitted earlier in the year for 12 bombardment, 21 pursuit, 4 attack, and 13 observation squadrons as part of its directed five-year expansion program.

Even with the proposed change in force structure from 1,800 to 2,320 aircraft, the Board's recommendations regarding the number of required squadrons provides clear insight into the War Department's aviation priorities. Clearly, the Drum Board valued the offensive capabilities bombers contributed to the defensive scheme of countering an invasion force before it reached shore. The proposed increase in attack squadrons highlights the importance placed on ground-support operations. However, the board's low opinion of the nation's

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[2] Futrell, 67.

[3] Futrell, 67-8.

susceptibility to aerial threats, primarily enemy bombers, may account for the reduction in the proposed number of pursuit squadrons.[4] Its use of a defensive scenario involving adversaries traveling great distances to attack the United States was cognitively consonant with national defense ideas of the time. Its focus on repelling troop landings and supporting ground operations downplayed the requirement for capacity to conduct air superiority operations.

Planning Evolves

In the summer of 1939, the character of joint war plans changed with the inclusion of a more holistic approach to the international environment. The Joint Board perceived the emerging threat of a two-front war.[5] The plans known as Rainbow thus emerged, removing the constraints of focusing on single countries as the color-indexed plans did. For example, Rainbow 1 detailed a defensive war by the United States acting alone to protect itself and the Western Hemisphere north of 10° S latitude, while Rainbow 2 considered a similar scenario but with the alternative of aligning with France and Great Britain. Rainbow 5 outlined a response should the United States face a coalition of enemies, namely Germany across the Atlantic and Japan in the Pacific. It became the strategic basis for American involvement in World War II with offensive action in both Africa and Europe.[6]

As the war in Europe unfolded, the Rainbow plans underwent a series of refinements. The fall of France precipitated a review and subsequent expansion of Rainbow 5.[7] The Navy Department, concerned about the strain a two-front war would put on naval resources, advocated a serial approach to defeating foes across the Atlantic before

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[4] Futrell, 68.
[5] Thomas E. Griess, ed., *The Second World War: Asia and the Pacific* (Singapore: Square One Publishers, 2002) 26.
[6] Ronald H. Spector, *Eagle Against the Sun* (New York, NY: The Free Press, 1985) 58-9.
[7] Futrell, 108.

going on the offensive against Japan. A 12 November 1940 memorandum from Chief of Naval Operations Admiral Harold Rainsford Stark posited four options for US involvement in the ongoing conflict. According to Admiral Stark, the United States could:

A) Limit American activity to the defense of the Western Hemisphere,
B) Give priority to Japan over Atlantic concerns,
C) Give each theater equal emphasis, or
D) Conduct an offensive campaign in the Atlantic and a defensive one in the Pacific.

The memorandum was later dubbed the "Plan Dog" memorandum because of the Navy's support for option D.[8] Stark's advocacy for "Plan Dog" was purportedly based on the expected economy of a combined effort against Germany while avoiding a potential for the United States to take on two foes single-handedly should the British succumb to German might.[9] In addition to the Navy Department's recommendations for national strategy, the memorandum also included recommendations to begin secret staff talks between the United States and Great Britain.

On 27 Mar 1941, the United States and Britain began the first of a series of formal discussions between the two countries' military staffs. Known as ABC-1, the first staff conversation explored strategic options and concluded that the basic combined war plan would be to defeat the most powerful of the Axis nations, Germany, first, through blockade, air offensives, early defeat of Italy, and a buildup of forces for an eventual land offensive in Northeast Europe.[10] Meanwhile, the United States

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[8] Mark Watson, *US Army in World War II: The War Department; Chief of Staff: Prewar Plans and Preparations*. (Washington D.C.: Historical Division, United States Army, 1950) 119.

[9] Watson, 118, footnote 79.

[10] (I) Henry H. Adams, *Harry Hopkins* (New York, NY: G. P. Putnam's Sons, 1977) 220. (II) Futrell, 108. While both Futrell and Adams agree about the result of ABC-1, Adams offers a closing date of 29 Mar while Futrell, corroborated by other sources, states 27 Mar.

would conduct a defensive campaign in the Pacific. Marshall submitted details of ABC-1 and Rainbow 5 to Roosevelt, who approved them on 2 June 1941.[11]

On 9 July 1941, Roosevelt asked the Secretaries of War and the Navy for an estimate of the production required to defeat likely enemies in a future war.[12] Haywood Hansell, a major in the Army Air Corps at the time, suggested that the request was "intended to produce an overall basis for war-production rather than an estimate based on strategic operations."[13] In terms of a proper response, the Joint Board would have required guidance about the objectives in a projected war, the nature of the military operations expected, the theaters, and timing. However, the Joint Board received no such guidance and used ABC-1 and Rainbow 5 as a framework for planning. The Air Corps provided its input as an Air Annex to the overall estimate.[14] In fact, the Air Corps seized the tasking as an opportunity to create an air plan to defeat Germany. Although the entire annex, entitled Air War Plans Division – Plan 1 (AWPD-1), focused on airpower production requirements for a future war, it also contained an operational plan to defeat Germany using heavy bombers in a strategic bombardment role.[15]

Lt Col Harold George, chief of the newly established Air War Plans Division (AWPD), built a plan based on the perceived fundamental requirement for an air offensive against Germany. His division derived the following airpower tasks from ABC-1 and Rainbow 5:[16]

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[11] Futrell, 108-9.
[12] Futrell, 109.
[13] Haywood Hansell, *The Air Plan That Defeated Hitler* (Atlanta, GA: Higgins-McArthur/Longino & Porter, 1972) 61.
[14] Hansell, 62-5.
[15] Futrell, 109.
[16] Hansell, 75-77.

- Conduct a sustained and unremitting air offensive against Germany and Italy to destroy their will and capability to continue the war,
- Provide air operations in defense of the Western Hemisphere,
- Provide air operations in Pacific defense, and
- Provide for the close and direct air support of the surface forces in the invasion of the Continent [Europe].

These tasks clearly placed the priority of action on strategic bombing. This is consonant with airmen's perceptions at the time that they could win independence for the air arm by demonstrating the success of strategic bombing as well as by prosecuting the war while other forces faced limitations in early operations. For example, the plans assumed a limited ability to place a sizable land force on the European land mass due mostly to the longer timeline required to organize, train, and equip a land force. AWPD-1 offered a means to attack Germany earlier, without having to wait for the buildup of land forces, and perhaps even to make an invasion unnecessary by defeating Germany with airpower.

Air Corps planners understood the need to eliminate the threat posed by the *Luftwaffe*. However, AWPD viewed the defeat of the *Luftwaffe* as an intermediate objective, and it planned to accomplish the task by neutralizing or destroying aircraft manufacturing facilities and fuel supplies while inflicting heavy attrition on German fighters using the massed firepower of large B-17 and B-24 formations.[17] These ideas relegated pursuit aviation to a secondary role and one focused on support to ground forces, since AWPD-1 assumed that heavy bombers could defeat the *Luftwaffe* and destroy its sources of production and supply while flying unescorted.

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[17] Hansell, 83-84.

Although this decision to fly unescorted missions appears inexplicable today, the limited range of fighters at the time led AWPD to its conclusions. The long ranges to targets within Germany made it impossible for existing fighters, which at the time lacked drop tanks, to go the distance.[18] The planners expected stiff resistance from enemy fighters and proposed a bevy of options to counter the threat including speed, altitude, defensive firepower and armor, and multiple, simultaneous penetrations of enemy territory. The use of defensive fighter escort was mentioned only as a working concept and specifically to close off the rear of bomber formations to enemy attack while they were still within the fighters' limited escort range.[19]

Logistics also constrained the role of pursuit aviation in AWPD-1 as well. The expectation of limited basing prompted the inclusion of guidance in AWPD-1 to keep pursuit aircraft to a minimum so as not to displace infrastructure which could otherwise be made available to bombers.[20] The reduction of pursuit aviation's role and the desire to maximize the effects of strategic bombing had major impacts on the overall proposed aircraft estimates in AWPD-1.

When approved by the Combined Chiefs of Staff in January 1942, AWPD-1 offered not only production requirements in the form of a proposed force structure and production schedule but also a strategic framework within which to employ air assets.[21] The adoption of AWPD-1 manifested itself in aircraft production in short order. Figure 3 shows the ratio of aircraft production between fighters and heavy/medium bombers delivered to the Army between July 1940 and December 1942. The high ratio for bombers shown in the chart after January 1942 is all

[18] Hansell, 83.
[19] Hansell, 308-9.
[20] Futrell, 110.
[21] Hansell, 98.

the more amazing considering the disparity in labor and resources required to build a bombardment aircraft as opposed to a fighter aircraft.

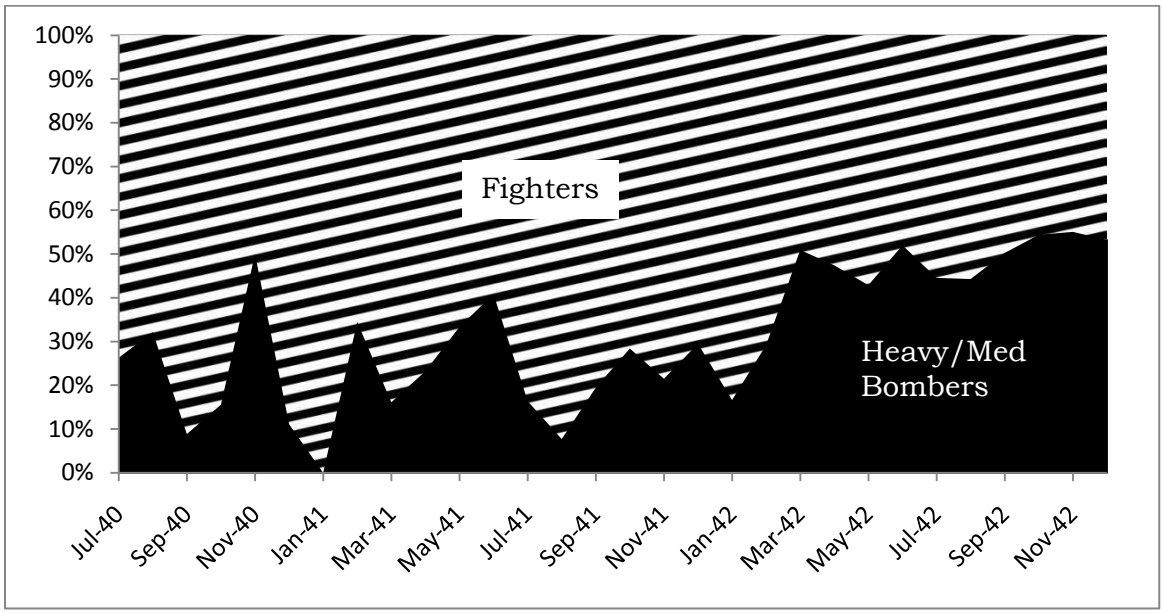

Figure 3: Army Aircraft Type Ratio (Jul 1940 – Dec 1943)

Adapted from AAF Statistical Digest: World War II, December 1945, Table 79.

Through AWPD-1, the Air Corps formally asserted the preeminence of bombardment aviation in national military strategy and disrupted the balance of aircraft types far into the future. While the AWPD approach to the coming war was based firmly on national defense ideas current at that time, the plan contradicted the theories of several influential airmen. Although the Air Corps' bombardment plans conformed closely to Giulio Douhet's and Billy Mitchell's theories, its ideas about pursuit aviation seemed to ignore the same theories, especially in the case of Mitchell's writings.

While Douhet questioned the value of interceptors to defend against bomber attacks, he supported the use of pursuit aircraft to prepare the way for bombers.[22] According to early writings from Douhet,

[22] Phillip Meilinger, "Giulio Douhet and the Origins of Airpower Theory." In *The Paths of Heaven: The Evolution of Airpower Theory*, 1-40 (Maxwell AFB, AL: Air University Press, 1997) 26.

"pursuit planes must clear the sky of enemy interference before the bombers can accomplish their mission."[23] Mitchell also placed pursuit aviation in higher regard than the AWPD planners. Mitchell believed that pursuit aviation was required to establish control of the air by eliminating its counterpart on the adversary's side.[24] AWPD planners' dependence on the self-defending bomber was at least partially in opposition to early airpower theorists' views on the utility of pursuit aircraft. However, despite this shift towards strategic bombardment, pursuit aviation would play an important role as the plans for Operation TORCH evolved.

Emergence of TORCH

Approval for AWPD-1 came during the ARCADIA conference, which convened in Washington D.C. to establish Anglo-American strategy.[25] Allied leaders developed the combined plan for an amphibious invasion of North Africa from a preliminary British plan, titled GYMNAST. The plan resulting from refinements by the combined staffs was the "first fruit" of a combined strategy and was later dubbed Operation TORCH.[26]

There were many reasons for a North African landing. From a combined-operations perspective, American and British leaders wanted to maintain Russian confidence in their Western Allies to oppose Germany as Russia sought relief from the Third Reich's assault.[27] Operation TORCH could provide some relief to the beleaguered Russians,

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[23] Giulio Douhet, *Command of the Air* (1942. New Imprint, Tuscaloosa, AL: The University of Alabama Press, 1998) 34.
[24] William Mitchell, *Winged Defense* (Tuscaloosa, AL: The University of Alabama Press, 2009 reprint of 1925 original) 164.
[25] Wesley Craven and James Lea Cate, *The Army Air Forces in World War* II. Vol. 2, *Europe: Torch to Pointblank, August 1942 to December 1943* (Washington, D.C.: Office of Air Force History, 1983) 42.
[26] Craven and Cate Vol. 2, 42.
[27] George F. Howe, *US Army in World War II: Mediterranean Theater of Operations, Northwest Africa: Seizing the Initiative in the West.* (Washington D.C.: Office of the Chief of Military History, Department of the Army, 1957) 11.

who were single-handedly absorbing Germany's assault. Additionally, Roosevelt wanted to engage the Germans as quickly as possible in an attempt to boost American and British morale.[28] Besides opening and maintaining Allied lines of communication through the Mediterranean, the landings' ultimate prize was Tunisia from which the Allies could strike Italy.[29]

The presence of the British Eighth Army, which was already engaging Rommel's *Afrika Korps,* combined with the possibility of turning France's northwest African colonies to the Free French and Allied causes, or at least denying them to the enemy, bolstered the case for the selection of North Africa as an invasion location.[30] The United States, in particular, viewed Axis occupation of western Africa as a security threat. The Army's War Plans Department indicated in September 1940 that the loss of Gibraltar to the Axis, and any Vichy French opening of Dakar, Senegal, to German U-boats and aircraft, would threaten Latin and South America, compelling the commitment of naval resources to defend the hemisphere.[31] Roosevelt noted in one of his famous "fireside chats" to the American public in December 1940 that the nation could not rely upon the Atlantic Ocean as a security buffer, remarking that "[at] one point between Africa and Brazil the distance is less than it is from Washington [D.C.] to Denver, Colorado."[32]

With the United States and Britain resolved to land in North Africa, General Dwight D. Eisenhower was named Commander-in-Chief of the

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[28] (I) Orr Kelly, *Meeting the Fox: The Allied Invasion of Africa, from Operation Torch to Kasserine Pass to Victory in Tunisia* (New York, NY: John Wiley & Sons, Inc., 2002) 15. (II) Howe, 12.
[29] Kelly, 15.
[30] Howe, 10.
[31] Watson, 116.
[32] Russell Buhite and David Levy, ed., *FDR's Fireside Chats* (Norman, OK: University of Oklahoma Press, 1992) 166.

Allied Expeditionary Force in August 1942.[33] The directive from the Combined Chiefs of Staff was to take control of northern Africa from the Atlantic to the Red Sea. Eisenhower sought to accomplish his tasking in three stages:

- Establish lodgments in the Oran-Algiers-Tunis area on the north coast to provide bases for air, land, and sea operations;
- Extend areas of control to the French territories of Morocco, Algiers, and Tunis; and
- Conduct offensive operations against the rear of Axis forces.[34]

The resulting plan for Operation TORCH called for three nearly simultaneous landings by as many task forces. Major General George S. Patton, leading the Western Task Force, was to land near Casablanca on the northwest coast.[35] His troops had orders to occupy the port of Casablanca and secure nearby airfields, establish and maintain communications between Casablanca and Oran, and build up forces to occupy Spanish Morocco should the Spanish decide to intervene on the Axis side.[36] The Center Task Force, led by Major General Lloyd Fredendall, would occupy the port of Oran and adjacent airfields, maintain communications with Casablanca, build up forces to secure Spanish Morocco if necessary, and establish and maintain communications between Oran and Orleansville.[37] In order to maximize the chances of Vichy French cooperation, the Eastern task force was to be led by an American for the landings but turned over to a British commander when directed by the Commander-in-Chief Allied Force. The tasks in the east were to occupy Algiers and adjacent airfields, build up

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[33] Charles Kirkpatrick, "Joint Planning for Operation Torch." *Parameters* 21 (Summer 1991): 73-85, 78.
[34] Howe, 16
[35] Howe, 39-40.
[36] Steven Ross, *U.S. War Plans: 1938-1945* 162.
[37] (I) Howe, 46, 71. (II) Ross, 162-3.

forces, and occupy Tunisia at the earliest possible date.[38] A map of the area of operations appears in Figure 4: Map of the Operation TORCH area.

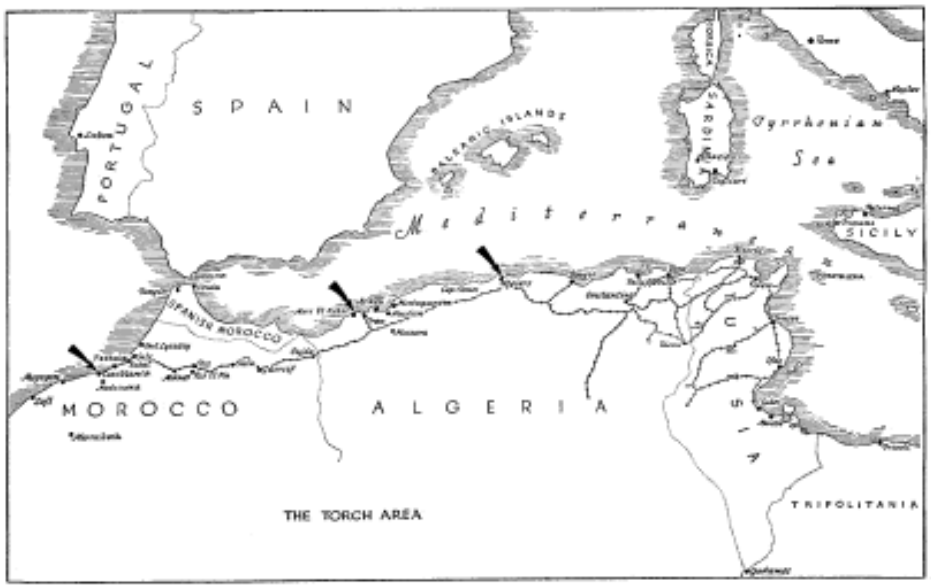

Figure 4: Map of the Operation TORCH Area

Source: Wesley Craven and James Lea Cate, *The Army Air Forces in World War* II. Vol. 2, *Europe: Torch to Pointblank, August 1942 to December 1943* (Washington, D.C.: Office of Air Force History, 1983) 45.

The plan for air operations in TORCH used two separate air commands. The Eastern Air Command, consisting of elements from the Royal Air Force, was to provide fighter defense in Algiers and for the advance toward Tunisia, and to provide support for the ground operations of the Eastern Task Force. The newly established XII Air Force would form the Western Air Command and be responsible for fighter defense of Casablanca and Oran, support for ground operations of the Western and Center Task Forces, and strategic bombing and fighter missions as directed by the Commander-in-Chief, Allied Force.[39]

This bifurcated command arrangement was problematic from the start. Eisenhower had a single naval commander and three land

[38] Ross, 163-4.
[39] Ross, 164-5.

commanders for the three landing forces. However, he was left with two separate air commands for which he and his staff would have to provide centralized direction and make force allocation decisions between the two.[40] Another issue was clarity of tasks for each air command. While the Eastern Air Command's role was explicit from assault to completion of the operation, the Western Air Command's duties were less clear once the landings were completed. Much of this lack of clarity was due to the use of the Western Air Command to guard against contingencies, such as potential movement against Spanish Morocco or repelling German attacks from Spain, and the need to await resolution of the easternmost landing.[41]

Operation TORCH wrestled with numerous uncertainties such as maintaining surprise for three separate landings and avoiding Spanish involvement with the arrival of such large forces so near their colonial territory. Perhaps the greatest uncertainty Operation TORCH planners had to consider was the reaction of French forces. The flexible posture required by Allied forces to hail the French forces as friends or destroy them as foes should they take an aggressive stance required adapting the air plan from more to less conventional approaches.

As part of the armistice signed with Germany in 1940, the Vichy French regime agreed to defend North Africa, particularly the colonies under French control.[42] However, the Allies hoped that the French would view their arrival as an opportunity to join forces against the Nazis. The air plan included a major show of force to dissuade the French from fighting and offer a reasonable justification for an honorable stacking of arms. Air planners sought a two-to-one numerical advantage to achieve this effect.[43] Since the main purpose of such a large force was

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[40] Craven and Cate Vol. 2, 53.
[41] Craven and Cate Vol. 2, 54.
[42] Kelly, 15.
[43] Craven and Cate Vol. 2, 55.

coercion rather than destruction, the Allies had to cede some traditional airpower advantages during the period of the landings.

Arnold had numerous reservations about the air plans for Operation TORCH based on their various vulnerabilities. First, the Chief of the Army Air Forces (AAF) noted that the need to achieve surprise and the attempt to win over the French forces all but prevented the use of aerial bombardment to soften resistance at the planned landing locations. Second, Arnold was concerned the *Luftwaffe* would mount a large-scale aerial attack. The Allies would be unable to counter major *Luftwaffe* operations effectively due to a scarcity of aircraft relative to the *Luftwaffe* during the initial days of the landings. Finally, Arnold lamented the absence of strategic targets in North Africa, denying the AAF the ability to fight the way it preferred.[44]

Arnold's first two concerns were well-founded. Airpower could not mitigate the risks of the amphibious landings due to its limited availability and related operational concerns. The plans called for seizing airfields, which was a requirement for flying in land-based aircraft to get them within close range of advancing ground forces. The aircraft designated to perform the fighter defense task for Western Command were to be transported on and flown off of aircraft carriers to their new fields.[45] Carrier aviation was responsible for the bulk of fighter defense and ground support work for the Western Command until ground forces secured airfields.

While plans for Operation TORCH limited the Allies politically and operationally, the Western Command faced limitations of its own in the skies over North Africa. Not only were initial aircraft quantities small, but the aircraft available to XII AF were not optimized for the tasks they were expected to accomplish. The length of the acquisition and

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[44] H. H. Arnold, *Global Mission* (New York: Hutchinson & Co, 1951) 186.
[45] Howe, 44.

production cycles and the rush to obtain aircraft in quantity resulted in sub-optimal pursuit aircraft for Operation TORCH and later campaigns in the Mediterranean theater of operations.

As mentioned in Chapter 2, production quantity received higher priority than new designs. Design stability was important to ensure the production of large quantities of aircraft. The pursuit aircraft used in Operation TORCH were conceived years before the landings in North Africa and were intended to meet the requirements for national defense espoused by American isolationists.

The P-40 Warhawk, P-38 Lightning, and P-39 Airacobra all played roles in North Africa as the only pursuit aircraft available when operations commenced in November 1942. Each had been designed years before in response to specific Air Corps requests. A brief survey of the expectations of pursuit aviation and the development of each of the pursuit aircraft flown will make clear their collective and individual roles in the Mediterranean Theater.

Pursuit Aviation Roles

The roles of pursuit aviation going into World War II had a historical foundation in the actions of such aircraft in The Great War. The Air Service Tactical School, later renamed the Air Corps Tactical School (ACTS), taught and refined courses on pursuit aviation. The texts used at the school provided doctrinal fundamentals for airmen and outlined what each type of aircraft was expected to do in combat.

In 1926, the Air Service Tactical School taught that combat operations would take place in three phases with the role of pursuit aviation changing in each. In the first phase, characterized by mobilization and concentration of forces, air forces were to focus on "strategical" operations as ground forces were not yet ready to engage the enemy. Coastal defense was a pursuit role in this phase, and pursuit aviation was to clear the air of hostile aircraft, allowing bombardment

and attack aviation units to engage the hostile fleet. The purpose of the first phase, then, was interference with and prevention of hostile preparations for an invasion of the United States.[46]

In the second phase, air forces were to support ground forces as they prepared to engage enemy troops either disembarking or about to do so. The focus of the air force at this point was first and foremost the destruction or neutralization of the enemy air force.[47] Pursuit thus further supported the second phase by conducting offensive operations against the enemy air force and cooperating with bombardment and attack operations.[48]

In the third phase, as opposing ground forces deployed and made contact, air efforts would focus on delaying hostile movement and employing bombardment and attack aviation against lines of communications, air depots, supply bases, and moving columns of ground forces, among other things. In this phase, pursuit was to continue the operations it began in the second phase and perform defensive functions such as screening ground movement and protecting friendly air forces in all their missions.[49]

A 1939 version of an ACTS text declared that the primary purpose of pursuit aviation is to protect against air attack. When in immediate support of ground forces, pursuit aviation was to defend friendly air bases from enemy attack, interdict enemy air reconnaissance and attack aircraft, and isolate enemy troops from their sources of supply.[50] Only the latter implied direct support to ground forces and even then appeared to advocate for battlefield air interdiction rather than close air support.

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[46] Air Service Tactical School, *Employment of Combined Air Force*, 1925-1926 text, 23, 25-26.
[47] *Employment of Combined Air Force*, 27.
[48] *Employment of Combined Air Force*, 28
[49] *Employment of Combined Air Force*, 31-33.
[50] Air Corps Tactical School, *The Employment of Combat Aviation*, April 1, 1939 text, 2-33.

Presentation notes from the same year reiterate the roles of pursuit aviation but also add distinctions among types of pursuit aircraft. These distinctions are useful because they describe specifically what activities the aircraft used in Operation TORCH were designed to accomplish. The ACTS course, "Pursuit Aviation," established three types of pursuit aircraft: the interceptor, an escort-type fighter, and what was at the time referred to as a support force fighter.[51]

The interceptor was to intercept and attack aircraft penetrating the area it was to defend. Interceptors were expected to be designed to have advantages in endurance and rate of climb, so that they could respond to threats on short notice. The escort-type fighter was expected to screen and defend bombers, but the course noted that no US fighter could yet perform this mission adequately due to the disparity in pursuit and bombardment aircraft range. The mission of support force fighters was to gain air superiority above friendly ground forces by denying the airspace to enemy observation aircraft and opposing the adversary in similar support fighter types.[52] The P-38 and P-39 were designed to meet the description of an interceptor, and the P-40 matched the characteristics of a support force fighter.

Curtiss P-40 Warhawk

The P-40 had the distinction of having the oldest basic airframe design of all pursuit aircraft used by XII AF in Operation TORCH. It was sold to other countries for their defense programs, and its nickname differed by purchasing country and equipment. The Warhawk moniker was bestowed on AAF models of the aircraft, though the basic design was shared by all variants. Although larger designation numbers typically indicate more recent aircraft designs, the P-40 was, in essence, an

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[51] Air Corps Tactical School, "Pursuit Aviation," Course notes, 1939-1940, 15-19.
[52] "Pursuit Aviation," 16-19.

improved Curtiss P-36 Hawk. Hence, the P-40 design actually pre-dated the P-38 and P-39.

In 1934, the Army Air Corps submitted specifications to industry for an all-metal, low-wing aircraft capable of attaining a maximum speed of 300 miles per hour.[53] Both Curtiss Aircraft and Alexander Seversky responded to the specification, and a competition ensued. Seversky's SEV-1XP beat out the Curtiss Model 75 after flight tests in 1936. The aircraft received the designation P-35, and the Army awarded Seversky a contract for 77 units.[54] As a consolation, Curtiss received a development contract and then a production contract the following year for the purchase of the Hawk 75 as the P-36.[55]

Curtiss continued to refine the design, and in the same year that it won the P-36 contract, the company also submitted another variant for Air Corps consideration. The Army's belief in the promise of liquid-cooled engines, and the Curtiss engineers' views that the radial engine would limit the P-36 service life, prompted Curtiss to submit a P-36 with a liquid-cooled Allison V1710 and a smooth engine fairing to tie it all together aerodynamically.[56]

The Allison V1710 was the only feasible choice for a liquid-cooled aircraft engine suitable for pursuit aircraft in the interwar years. Its main competition, the Curtiss Conqueror, could not sustain the high operating temperatures with the use of ethylene glycol, a chemical the Army insisted on using in the cooling system. As a result, the Allison

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[53] William Green and Gordon Swanborough, *US Army Air Force Fighters, Part 1* (New York, NY: Arco Publishing Co, 1977) 29.
[54] Page Shamburger and Joe Christy, *The Curtiss Hawks* (Kalamazoo, MI: Wolverine Press, 1972) 91.
[55] (I) Green Part 1, 30. (II) William Green and Gordon Swanborough, *US Army Air Force Fighters, Part 2* (New York, NY: Arco Publishing Co, 1978) 61.
[56] (I) Peter Bowers, *Curtiss Aircraft: 1907-1947* (London, England: Putnam & Company Ltd., 1979) 362. (II) Shamburger, 112.

engine powered all of the pursuit aircraft the Air Corps employed during Operation TORCH.[57]

A key reason for the higher engine temperatures as pursuit aircraft developed in the interwar years was higher compression ratios. By compressing the fuel-air mixture to a higher pressure, the combustion stage produces more power. Higher compression demands a more refined fuel to prevent premature detonation of the fuel-air mixture.

Fortunately for the Allies, Jimmy Doolittle recognized the need for higher octane fuels to withstand higher compression ratios. He used his position in the early 1930s as an executive with the Shell Oil Company to encourage the development of 100-octane aviation fuel. The refined fuel netted a 7 percent increase in speed and a 40 percent increase in rate of climb in contemporary fighters.[58] Curtiss took advantage of both of these developments by mating the Allison to the P-36 airframe.

Calling the aircraft the XP-37, the Army accepted the Curtiss offering but was not thrilled with its performance. The Air Corps ordered several test articles and approved Curtiss' proposals to have Allison modify the turbo-superchargers on their V-1710.[59] In 1938, Curtiss returned with the modifications, and the Army Air Corps ordered the aircraft known officially as the XP-40.[60] While the experimental version first flew in October 1938, production P-40s did not begin leaving the factory until 1940.[61]

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[57] Birch Matthews, *Cobra! Bell Aircraft Corporation 1934-1946* (Atglen, PA: Schiffer Military/Aviation History, 1996) 352-3, 365-6.
[58] Geoffrey Perret, *Winged Victory: The Army Air Forces in World War II* (New York, NY: Random House, 1993) 40.
[59] Shamburger, 112-3.
[60] Shamburger, 113.
[61] Bowers, 474.

Figure 5: P-40 Warhawk

Source: U.S. Air Force photo

The specifications that the P-40 met were based on the requirement for low-altitude engagements and ruggedness to conduct both coastal defense and ground-support missions.[62] While it may not have been the most advanced fighter in the Army inventory at the start of TORCH, the P-40 was very capable in the hands of a skilled pilot and was ultimately produced in great numbers mostly because it was the best design available when the need for aircraft was immediate.[63]

The speed and quantity of P-40 production was aided by the fact that the design was based on the P-36, which was still in production as the P-40 was being manufactured. Figure 6 highlights the sustained level of P-40 production and the delay between P-40 production and that of subsequent pursuit aircraft. Notice that the other pursuit aircraft used in quantity in Operation TORCH, the P-38 and P-39, were not produced in significant quantities until the latter half of 1941, little more

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[62] William Green, *Famous Fighters of the Second World War* (Garden City, NY: Doubleday & Co) 1975.
[63] Bowers, 475.

than a year before the landings in North Africa. More advanced pursuit aircraft, such as the P-47 and P-51, were not produced in quantity until TORCH had already begun.

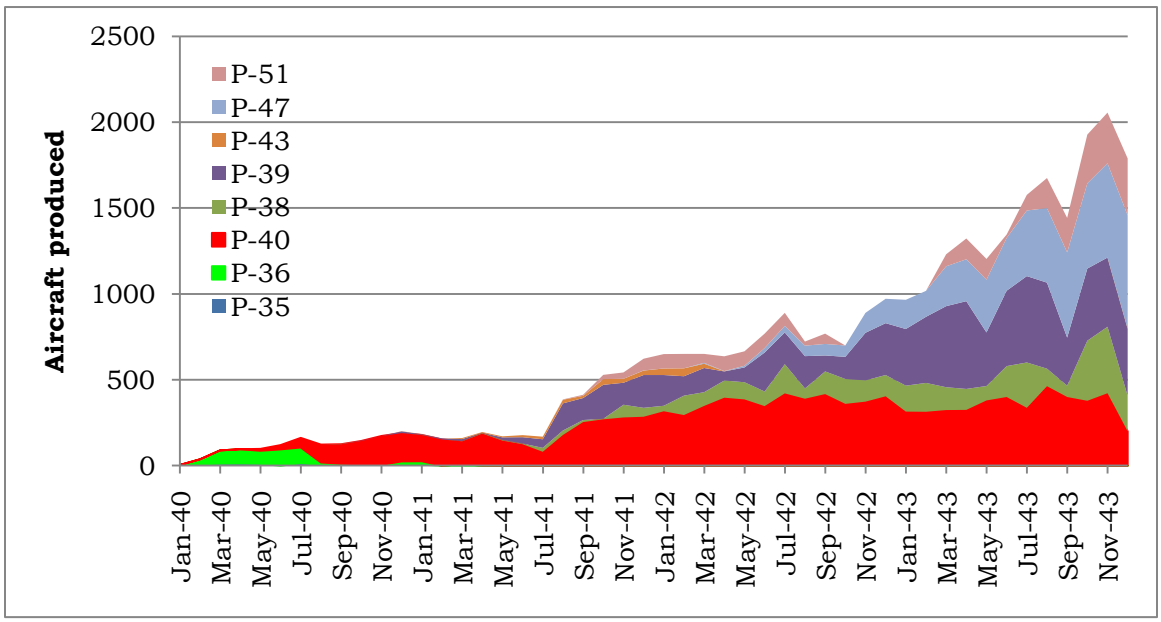

Figure 6: US Pursuit Aircraft Production

Adapted from AAF Statistical Digest: World War II, December 1945, Table 76.

The Air Corps continued producing the P-40 even when better designs were available because its production line was flowing and the design was mature, thereby avoiding the learning curves inherent in manufacturing a new design.[64] By European standards, the P-40 was obsolete even before it flew.[65] Its continued use is explained by its availability in greater quantities than any other fighter from 1941 to 1943.

While Curtiss made some improvements to the design, the inadequacies of the P-40 were never resolved. The Warhawk's lack of heavy firepower, non-sealing fuel tanks, and protective armor during

[64] Bowers, 475.
[65] Bowers, 474.

early production runs reflected the Air Corps' specifications.[66] The Air Corps considered some engine modifications, such as including a multi-stage supercharger to enhance performance, but they were considered imprudent in light of forthcoming designs.[67] Nonetheless, the P-40 was available in large numbers at the beginning of Operation TORCH and was, therefore, used extensively.

P-38 Lightning

In 1936, after losing a competition for a multi-seat fighter to Bell, Lockheed participated in Air Corps Design Competition X-608 for a twin-engine interceptor.[68] The accompanying specifications called for an aircraft that could reach 20,000 feet of altitude within six minutes, and a top speed of 360 mph at altitude and 290 mph at sea level.[69] On 23 June 1937, Lockheed won the design competition and was awarded a contract for the construction of a single XP-38 prototype.[70] On 20 September 1939, the Air Corps ordered 66 P-38 aircraft from Lockheed.

Both the French and British ordered P-38s, with the French submitting the first order in April 1940. When France fell, the British absorbed the French order but were unhappy with the performance of the first three aircraft they received.[71] The British tested aircraft from early production runs with a 300 mph top speed that were unstable at lower speeds due to both propellers spinning in the same direction.[72] Following a contract dispute between the British and Lockheed, foreign

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[66] Bowers, 474.
[67] Green, 214.
[68] René Francillon, *Lockheed Aircraft Since 1913* (Annapolis, MD: Naval Institute Press, 1987) 161.
[69] (I) Gene Gurney, *The P-38 Lightning* (New York, NY: Arco Publishing, 1969) 7. (II) Green, 23.
[70] Francillon, 162.
[71] Francillon, 164.
[72] Jeffrey Ethell, *P-38 Lightning* (New York, NY: Crown Publishers, 1983) 7.

orders lapsed and production reverted strictly to deliveries for the Air Corps.[73]

Figure 7: P-38 Lightning

Source: U.S. Air Force photo

The unorthodox design of the P-38 offered pilots a number of benefits. The twin booms carrying the engine nacelles provided unimpeded visibility from the bubble canopy. The four nose-mounted machine guns and 20 millimeter cannon provided concentrated firepower, and the introduction of counter-rotating propellers made the aircraft quite stable at all speeds and eliminated problems with torque.[74]

The design had a few drawbacks, as well. For one, the complexity of the controls and intricacies of the Lightning's handling required more training. Also, the P-38 suffered from the effects of aerodynamic compressibility at high speeds, usually in a dive, which hindered or prevented the pilot from controlling the craft.[75]

The Lightning was produced in smaller quantities than any other major Army fighter in World War II.[76] There were fewer P-38s available to support Operation TORCH than either P-39s or P-40s. Nonetheless,

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[73] Francillon, 164.
[74] Ethell, 20-23.
[75] Ethell, 6, 23.
[76] Green, 23.

the P-38 would go on to earn an honorable combat record in the skies over North Africa.

P-39 Airacobra

In 1936, the Army's evaluation of liquid-cooled engine technology inspired a new pursuit aircraft competition. Initially, the desired characteristics were a speed of 325 mph or greater at an altitude of 20,000 feet and 275 mph or greater at sea level. Additionally, the Air Corps desired a time to climb of five minutes or less. The specifications detailed an aircraft expected to be used in an interceptor role.[77]

As different agencies within the Air Corps continued to discuss pursuit characteristics, the performance thresholds continued to evolve until specification X-609 emerged in March 1937, a month after X-608 was released for a twin-engine interceptor. X-609 stipulated a minimum high speed of 360 mph at an altitude of 20,000 feet, 270 mph at sea level, and a time to climb of six minutes or less. The similarities between X-608 and X-609 were more than coincidental as the Air Corps ultimately intended to have the winners from each specification compete against each other.[78]

The Air Corps carefully managed its justification for a single-engine pursuit interceptor to show complementarities to a long range, 3,000 mile, multi-place interceptor.[79] Bell had previously won the contract for that aircraft with the XFM-1, an aircraft that resembled an armed light bomber more than a sleek fighter. In an attempt to secure funding for an additional interceptor, the Air Corps advertised that the aircraft meeting specification X-609 were to be employed in the protection of vital areas, providing a more localized defense while freeing up the XFM-1 for

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[77] Birch Matthews, *Cobra! Bell Aircraft Corporation 1934-1946* (Atglen, PA: Schiffer Military/Aviation History, 1996) 63-65.
[78] Matthews, 67-75.
[79] Matthews, 68.

defensive tasks requiring longer range.[80] Specifically, the desired aircraft was intended to intercept unescorted high-altitude bombers.[81]

Bell won the design competition in October 1937 and received a contract for the XP-39. From there, Bell modified the design to address unfavorable stall characteristics, include a 37-mm cannon instead of the planned 25-mm version, and refine engine and power transmission performance. The modifications increased the weight of the aircraft and delayed the maiden flight until February 1939. Even by then, the supercharged Allison engine, planned as an integral part of Bell's design, was not yet ready, and Bell flew the design with an Allison engine which lacked the supercharger.[82]

Between award of the XP-39 contract and its first flight, the political situation in Europe worsened, and Roosevelt had already decided to build up the air forces. As America approached the brink of war, the Air Corps urgently sought better performance than what was available in the P-40s already in production. Consequently, the Air Corps reduced the specifications for the single-engine pursuit fighter so that maximum speed was measured at 15,000 feet rather than 20,000 feet. This opened up the possibility for the XP-39 to achieve the threshold maximum speed in specification X-609 without the supercharger, a situation which would bypass the indeterminate wait for Allison to mature the required technology.[83]

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[80] Matthews, 68.
[81] Matthews, 75.
[82] Matthews, 77-89.
[83] Matthwes, 89-90.

Figure 8: P-39 Airacobra

Source: U.S. Air Force Photo

The Air Corps' relaxation of the requirements proved to be a dual edged sword that bestowed a blessing and a curse on the P-39. The turbocharger for the XP-39 proved to be troublesome when it was finally developed. The cooling system it required was riddled with design problems and imposed a significant drag penalty on Bell's design. Alternatively, the XP-39 met the Air Corps specifications without the supercharger. The Air Corps contracted with Bell for the P-39 in October 1939.

The Air Corps' specification change proved fateful for the P-39. Its narrow stipulation for speed at a lower altitude did not have a complementary adjustment for any requirement at higher altitudes. As a result, Bell was able to meet the threshold requirements in a narrow spectrum while giving up capability at higher altitudes. The lack of a supercharger prevented the Airacobra from achieving the high altitudes desired in the early design stages and eliminated the possibility of accomplishing the role for which it was initially intended. Hence, the aircraft was relegated to medium altitudes and, eventually, a second-rate fighter status.[84]

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[84] Matthews, 91-103.

The AAF supported Operation TORCH and the Tunisian campaign with pursuit aircraft designed before America began its rearmament program. American pursuit aviation in the early years of the war was shaped by technology developed in ignorance of the character of the war in Europe. Aircraft specifications were geared toward strategic defense of the nation rather than operations in foreign lands. The rush to accelerate aircraft production left the AAF with a ground support fighter, an interceptor, and another plane which would not reveal its usefulness until tested in combat. The AAF did not go to war in North Africa with the pursuit fleet it needed, but it found ways to make the aircraft it had do what they could to support Allied operations.

Chapter 4

Lighting the TORCH

The Allies had amassed enough combat forces by November 1942 to attempt an amphibious assault along the coast of North Africa. While history would judge Operation TORCH as a vital Allied success, not everything went according to plan. The Allies learned numerous lessons from early combat operations against the Germans, and the experience gained in Operation TORCH and throughout North Africa affected how the United States fought the rest of the war. This was particularly true of the US Army Air Forces (AAF), which drew several conclusions from early interactions between their pursuit aircraft and the *Luftwaffe*.

Operation TORCH could be described in two phases: the amphibious landings and the advance to Tunisia.[1] As Allied forces approached the landing sites in North Africa, the AAF had no role to play. A large contingent of American aircraft intended for the XII AF in the early stages of the invasion remained aboard the small carrier *USS Chenango*.[2] The 76 P-40s of the 33rd Fighter Group were to be catapulted from the ship to land at their new base when the Port Lyautey airfield was secured.[3] The air arm of the naval fleet conducting the invasion was responsible for protecting the convoy and providing support

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[1] George F. Howe, *US Army in World War II: Mediterranean Theater of Operations, Northwest Africa: Seizing the Initiative in the West* (Washington D.C.: Office of the Chief of Military History, Department of the Army, 1957), 89.

[2] The qualification of "American" aircraft is necessary to distinguish between aircraft built by US manufacturers and Spitfires procured from the British for use by the AAF. This thesis is scoped to address US pursuit aircraft, and the omission of discussion about the contribution of British pursuit aircraft used by the AAF is not intended to marginalize the efforts of the men and units who flew and supported them.

[3] (I) Orr Kelly, *Meeting the Fox: The Allied Invasion of Africa, from Operation Torch to Kasserine Pass to Victory in Tunisia* (New York, NY: John Wiley & Sons, Inc., 2002).

for the landings until the XII AF could assume its land-based responsibilities.[4]

The Western Air Command expected to have 160 fighters, 13 fighter/observation aircraft, and 15 light bombers in place at Casablanca by D+6 to support the Western Task Force. Subsequently, 80 aircraft were scheduled for transfer to the Oran area after the threat of French resistance subsided.[5] The Central Task Force was to be supported by a similar-sized air force in the vicinity of Oran to be brought in from Gibraltar and in place by D+9. The missions for land-based aircraft were to be fighter defense, cooperation with ground forces, tactical and strategic bombing, reconnaissance, and support for airborne operations.[6]

The landings commenced on 8 November 1942 but not without some difficulty. The French resisted more fervently than expected, and German air superiority near the Oran landings allowed the *Luftwaffe* to harass Allied troops with near impunity.[7] Resistance at Casablanca prevented the immediate seizure of the airfield at Port Lyautey in the western landing area, affecting the timeline to get XII AF aircraft operational and contributing to the battle. On 10 November 1942, the 33rd launched from the *Chenango*.[8] Too late to participate in support of the landings, it was hurried into place to counter the potential threat of Spanish forces intervening in North Africa or German forces using Spanish bases to launch an attack.[9]

The P-40s safely launched from the carrier, but the routine tasks of ferrying an aircraft and landing on an austere airfield proved problematic. Over 25 percent of the 33rd's aircraft were affected by the

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[4] Wesley Craven and James Lea Cate, *The Army Air Forces in World War II.* Vol. 2, *Europe: Torch to Pointblank, August 1942 to December 1943* (Washington, D.C.: Office of Air Force History, 1983), 68-70.
[5] Howe, 46.
[6] Howe, 48-50.
[7] (I) Craven and Cate Vol. 2, 74. (II) Kelly, 91.
[8] Howe, 77.
[9] Kelly, 39.

relocation to a land-based field with one crashing, another losing its way in the fog, and seventeen damaged upon landing. Thirty-five additional P-40s, arriving on D+5, fared little better with four being damaged due to pilot inexperience.[10] Such incidents continued weeks into the operation, with six P-38s lost when trying to land at an unfamiliar field after dark.[11] The losses were costly due to the limited availability of replacement aircraft and demonstrated an underestimation of the difficulties associated with establishing austere airbases.

The flow of pursuit aircraft to support the Western Task Force was further disrupted due to issues with the P-39.[12] The contingent of Airacobras intended for the area near Casablanca had originally been built for delivery to Russia. The aircraft were diverted for AAF use but required modification before American pilots could fly them into combat. The modifications were accomplished at the under-resourced VIII AF Service Command facilities and were, resultantly, completed one-to-two months behind schedule. To make matters worse, unfavorable winds and aircraft breakdowns further delayed the P-39s in Portugal, a stopping point along the ferry route from Great Britain to North Africa.[13]

Pursuit support for the Central Task Force flowed more smoothly. By D+11, XII AF pursuit assets near Oran included four fighter groups minus one squadron. However, timely aircraft delivery was not enough to achieve desired effectiveness. The distance between pursuit airfields and the locations of intense fighting where air support was most needed limited the support the XII AF could provide, but logistics issues proved even more problematic. The scattering of ground support echelons and limitations in quantity and quality of airfields further hampered support

[10] Craven and Cate Vol. 2, 77.
[11] Craven and Cate Vol. 2, 84.
[12] Craven and Cate Vol. 2, 83.
[13] Craven and Cate Vol. 2, 60.

to Allied operations.[14] In fact, logistics was a systemic problem for the XII AF in North Africa. Difficulties due to scarcity of spare parts and supplies were prolific, and the slow buildup of aircraft in the theater took its toll on air operations in general.

Logistics Issues

The challenges of logistical support to the invasion of North Africa impacted the AAF's ability to fight. Limitations of spare parts availability and supply capacity reduced the overall contribution of pursuit aviation especially. In the long run, however, the AAF's ability to mitigate logistics issues let it bring an overwhelming force to bear against the Axis Powers.

From the beginning of operations, pursuit aircraft were in short supply. To mass an initial pursuit force for the Western Air Command, the 33rd Fighter Group's P-40s were shipped via an aircraft carrier, as were 35 replacement aircraft, which arrived on the *HMS Archer*.[15] Those replacement aircraft, arriving five days into the operation, were the last to arrive until 6 December 1942, nearly a month into Operation TORCH.[16] The meager flow of replacement aircraft is all the more shocking when one considers that aircraft losses were expected to be as high as one third of initial squadron strength each month.[17]

Airmen anticipated an initial aircraft shortage, and besides shipping aircraft with the initial wave of the invasion forces, the XII AF was augmented in time with two P-38 groups that had initially been assigned to the VIII AF in Great Britain. Getting aircraft into theater remained a problem, however. The short range of most pursuit aircraft made it impossible to conduct ferry missions across the Atlantic. Many

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[14] Craven and Cate Vol. 2, 82-3.
[15] Craven and Cate Vol. 2, 58.
[16] Craven and Cate Vol. 2, 128.
[17] USAFHS 105, 22.

fighters were shipped in crates to the United Kingdom to be reassembled and flown into North Africa until a depot could be constructed in the Mediterranean theater to permit more direct delivery.[18] The need to use shipping to deliver aircraft forced aircraft to compete with other required war materiel for this scarce transportation commodity.

Delivery of aircraft was only part of the problem. The ability to get needed parts and supplies to the forward locations added to the logistical challenge. By rail, delivery was hampered by the low allocation of capacity given to the XII AF. C-47 aircraft were sometimes used to support the logistics tail of the air force in theater. Ground transportation was also used, but again, the amount allocated to XII AF was too low for the level of operations desired.[19] The systemic logistics problems facing Eisenhower's forces prompted him to initiate an operational pause between 3-9 December 1942 to allow for resupply and buildup, but pursuit forces could not take advantage of this respite due to the need to combat enemy air actions.[20] The burden on pursuit aviation was mounting, and Eisenhower described his air support as an insufficient force with limited maintenance facilities and on the brink of a systemic breakdown.[21]

Numerous changes to aircraft beddown taxed the logistics systems even more. A key component of the plans for Operation TORCH was mobility to push the Germans to the east. To provide effective support and overcome range limitations, pursuit aircraft required several changes in beddown locations to keep up with the ground forces and remain within striking distance of the engagement areas.[22] The austerity and inadequacy of some of the airfields captured to support pursuit aviation

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[18] (I) Howe, 54. (II) Craven and Cate Vol. 2, 130.
[19] Craven and Cate Vol. 2, 126.
[20] Craven and Cate Vol. 2, 90-1.
[21] Howe, 320.
[22] Craven and Cate Vol. 2, 125.

once again raised the requirement for already scarce logistics support, especially engineering units trained to build new airstrips.[23]

Attrition and reduced mission capability due to supply, maintenance, and other logistical shortfalls created a condition of ever-decreasing numbers of pursuit aircraft available for operations during the very early stages of TORCH. Aircraft delivery could not meet the demand for replacement. By 1 February 1943, the 33rd Fighter Group had only 13 aircraft, and another group at higher strength had to replace it in the midst of heavy operations.[24] This case was not unique. The absence of replacement aircraft forced XII AF to rob higher-strength units to keep battle-weary units flying or relieve the entire unit and replace it with another at full aircraft and pilot strength. The AAF needed to get more pursuit aircraft into theater.

The P-38 fleet, seemingly always in short supply, received an early boost in North Africa for three reasons: moving all of VIII AF's P-38s to the Mediterranean, giving them higher priority for shipment than some other war materiel, and innovating a method to carry Lightnings on specially built support stands on the upper deck of tankers helped speed their delivery. P-40s faced a similar, though less pronounced, shortage, and here too the Allies found a way to get adequate numbers into theater. The donation of 25 Warhawks to a newly formed French unit called the Lafayette Escadrille and the high losses sustained in combat amplified the need for replacement of that aircraft type. The *USS Ranger* answered the call and twice ferried 75 P-40s in both December 1942 and February 1943.[25]

Very early in the operation, logistics hampered pursuit operations. There was little motor transport for supplies, a lack of shelters to facilitate maintenance in difficult weather conditions, and a dearth of

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[23] Craven and Cate Vol. 2, 55.
[24] Craven and Cate Vol. 2, 131.
[25] Craven and Cate Vol. 2, 131.

runways capable of supporting combat operations when the ground was wet.[26] Additionally, relative loss rates were not as favorable as the Allies would have hoped. The following chart indicates that with the exception of January 1943, Axis and AAF fighter loss rates of pursuit aircraft due to action against other fighters in the Mediterranean theater were only slightly more favorable for the AAF. Continuation of nearly equivalent loss rates would have placed the AAF at a disadvantage due to the amount of effort and time (i.e. transport and preparation of aircraft for combat) required to replace their losses. Fortunately, the comparative loss rate improved for the AAF in February 1943 for several reasons related to logistics.

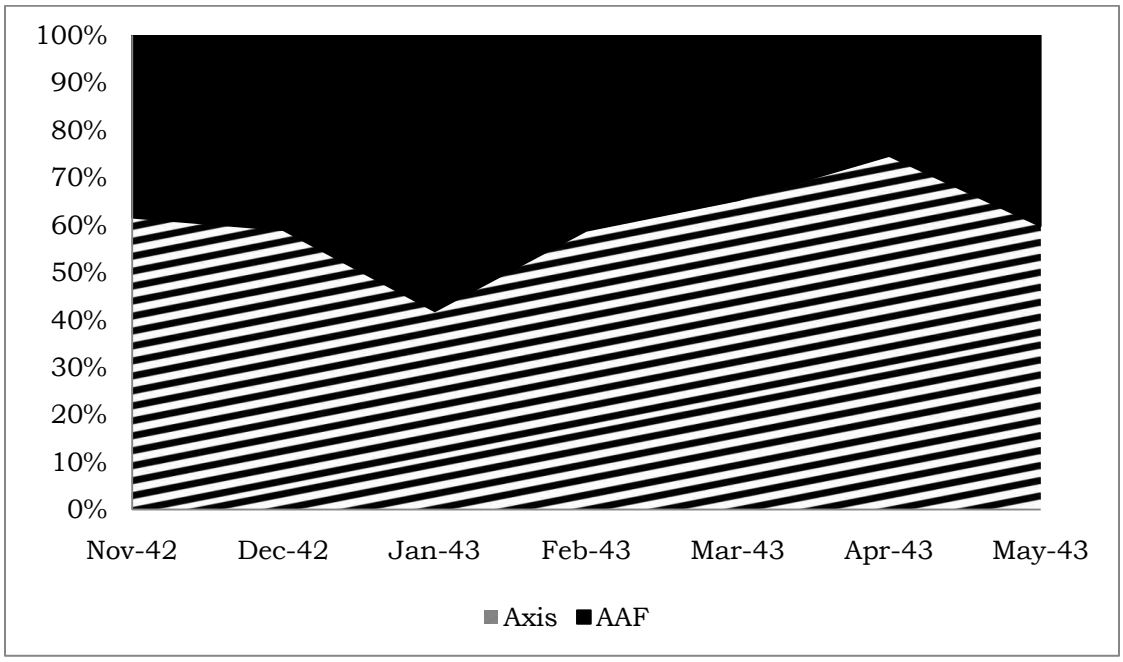

Figure 9: Comparison of Fighter Loss Rates Due To Air Action

Adapted from AAF Statistical Digest: World War II, December 1945, Tables 160, 168.

Simply stated, the capacity of the logistics system improved while that of the Axis decreased. With the creation of depot facilities in North Africa and innovations to improve throughput on the waterways and at the ports, the Allies were able to bring more resources to bear against the

[26] (I) Jack Coggins *The Campaign for North Africa* (Garden City, NY: Doubleday & Co, 1980) (II) Craven and Cate Vol. 2, 83.

enemy. Figure 10 illustrates the increasing availability of pursuit aircraft in the Mediterranean theater. The improvement in Allied logistics occurred with a concomitant decrease in the capacity for Axis logistics to replace its losses. Field Marshall Erwin Rommel later recounted that the war in North Africa was decided to a great degree by the Battle of the Atlantic, a reference to the contest between delivery of Allied war materiel via Atlantic waterways and the attempts by Germany to interdict those supplies.[27]

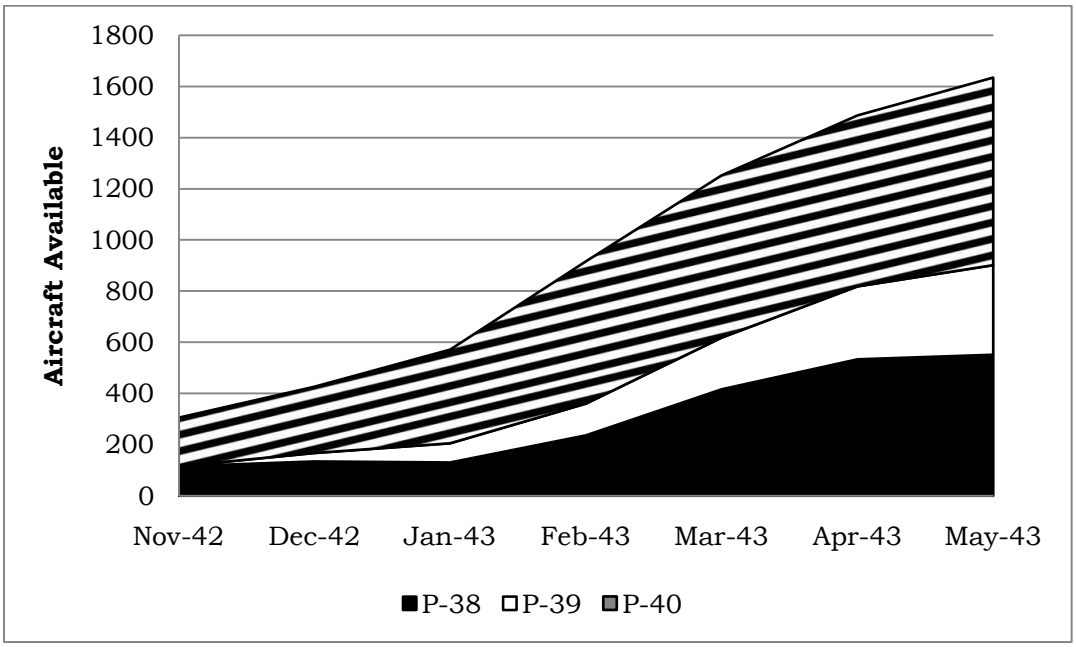

Figure 10: Pursuit Aircraft Available in Mediterranean (Nov 1942-May 1943)

Adapted from AAF Statistical Digest: World War II, December 1945, Table 90.

Another logistical factor influencing Allied success in pursuit aviation was beddown locations. In the opening months of Operation TORCH, and particularly during the race to Tunis, the ability to support ground force mobility through the practice of advancing beddown locations added to problems in the logistics system. This practice made distribution more difficult and hindered the ability to concentrate supply and maintenance resources where they were needed. At first, attempts

[27] Kelly, 153

to place pursuit aircraft closer to the fighting provided little benefit as the available fields were many miles from combat. At one point, Allied airfields were 70 miles from the main engagement while Axis aircraft were only minutes away, resulting in a need for 3-to-1 numerical superiority to overcome the range disadvantage and achieve parity in loiter time.[28] Axis pilots took advantage of the situation by avoiding contact with Allied aircraft during their short loiter time, then pressing their attacks after the fuel-depleted Allied aircraft departed.[29] Longer travel distances and the short range of pursuit aircraft limited their effectiveness in the air.[30] The basing situation increased fuel demand and maintenance requirements as AAF pursuit aircraft had to fly farther and longer to engage the enemy.

This situation changed in the latter months of the operation. As the Allies progressed across North Africa, it was they who enjoyed an advantage in proximity of pursuit aircraft to enemy engagements.[31] As the Allies overran airfields, the Axis was eventually forced to base most of their pursuit aircraft in Sicily, creating a range disadvantage difficult to overcome. However, one advantage the AAF did not enjoy in the employment of pursuit aircraft during the entirety of Operation TORCH was in the area of air-ground cooperation.

Air-Ground Cooperation

As mentioned in Chapter 3, the AAF was aware of the role that pursuit aviation would play in supporting ground forces. Not only did course notes for the 1939-1940 iteration of the ACTS course, "Pursuit Aviation," identify a specific category of pursuit aircraft intended to protect ground forces, the support force fighter, it also described the

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[28] Kelly, 103.
[29] Kelly, 102.
[30] Craven and Cate Vol. 2, 89.
[31] Kelly, 353.

method in which the fighter would be employed. According to the course, pursuit aircraft were to provide security for friendly air and ground forces by gaining air superiority over enemy observation aircraft and similar fighter types.[32] The absence of a mission profile for direct support of ground units in the pursuit course should not be considered an indictment of pursuit aviation so much as an indication of the air arm's limited expectations for employing pursuit aircraft in support of ground operations. After all, Field Manual (FM) 31-35, *Aviation in Support of Ground Forces*, was a more appropriate document to cover air-ground cooperation. Besides, from the perspective of pursuit aviation proponents, the category of aircraft identified as attack could best provide the capability to conduct close air support operations.

The coining of the term "attack" to describe a type of aircraft may be attributed to Billy Mitchell, who in 1928 described attacks on ground troops as an additional special mission for pursuit aircraft.[33] Captain George C. Kenney, an instructor at the Air Corps Tactical School at Langley Field from 1926 to 1929, authored course material for the Observation and Attack Courses.[34] The ideas Kenney penned about attack aviation remained as core doctrine with little further development after his departure from the school. While attack aviation was intended to specifically support ground forces, the influence of air theorists like Douhet changed the focus of attack aviation in the intervening years between Kenny's departure and the onset of conflict in North Africa to a counter-air slant, suggesting that attack aircraft could attain the best benefit by attacking targets beyond those immediately threatening ground forces.[35] Worse yet was the fact that FM 31-35, the document

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[32] Air Corps Tactical School, "Pursuit Aviation," Course notes, 1939-1940, 15-19.
[33] Richard Muller, "Close Air Support," in Williamson Murray and Alan Millett *Military Innovation in the Interwar Period* (New York, NY: Cambridge University Press, 1998) 154.
[34] Thomas Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* (Maxwell AFB, AL: Historical Division, Air University, June 1953) 66.
[35] Greer, 67.

which should have best described how air could support ground forces, did less to describe the employment of air operations in support of ground forces than address desired organizational structures.[36] The result was an obvious dearth of thinking in the air arm for how to employ air forces in close support of ground troops. The disparity in ideas of the meaning of ground support between those in the pursuit and attack aviation communities was dwarfed only by the separation in expectations between airmen and the ground forces that required their support.

The Army and its Air Force did not reconcile their different ideas of what was meant by ground support at the beginning of World War II. This issue was compounded by a deficiency in training for air-ground coordination.[37] One explanation for the lack of adequate training is the low priority it received due, in part, to the belief in early 1942 that American troops would not engage the enemy in Europe (or other theaters requiring land-based close air support) for several more years.[38] The lack of air-ground cooperation proved costly on 26 November 1942, when American P-38s chased Axis planes away and subsequently turned their attention to ground troops below. These deadly ground attacks mistakenly targeted an American unit, Company C, 701st Tank Destroyer Battalion, killing five men, wounding sixteen, and heavily damaging most of the unit's guns and vehicles.[39]

Failure to place appropriate emphasis on air-ground cooperation not only resulted in targeting errors and friendly-fire incidents but also created inefficiency and ineffectiveness in the employment of pursuit aircraft for ground support missions. Air and ground commanders not only disagreed about the definition of ground support but also about command relationships. The core of the disagreement was the difference

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[36] Futrell, 133.
[37] Howe, 61.
[38] Kelly, 129.
[39] (I) Kelly, 103. (II) Howe, 302.

in opinion about the appropriate level of centralization or decentralization of the air forces to meet requirements for ground forces.[40]

Airmen sought centralized control of air resources to guard against the concern that assignment of an air unit to support a ground unit directly would result in the inability to use a flexible resource at the time and location which could provide the joint force the most benefit. Ground commanders sought decentralized control to allay their fears that the air force wished only to pursue independent operations at the risk of neglecting support to ground units.[41] Distributing airpower across ground units in a more decentralized manner led British commanders to coin the term "penny packets" to describe the way concentrations of airpower were broken into small, ineffectual bundles.[42]

The use of penny packets early in the operation caused serious failings of airpower to achieve objectives in missions important to the ground forces, including air superiority, interdiction, and close support.[43] Ground commanders' attempts to guarantee the benefits of airpower for their units, in effect, made airpower ineffective at the operational level. Air commands were reorganized later in Operation TORCH, setting the stage for future air-ground cooperation relationships. On 19 February 1943, the Mediterranean Air Command stood up and was comprised of the XII AF and IX AF from the AAF as well as the Royal Air Force Eastern, Middle East, Malta, and Gibraltar Commands.[44] Air Chief Marshall Sir Arthur Tedder was in overall command, with a

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[40] Howe, 673.

[41] (I) Howe, 673. (II) Eduard Mark *Aerial Interdiction: Air Power and the Land Battle in Three American Wars* (Washington, D.C.: Center for Air Force History, 1994) 16.

[42] Mark, 16.

[43] Robert F. Futrell, *Ideas, Concepts, and Doctrine: Basic Thinking in the United States Air Force* (Maxwell AFB, AL: Air University Press, December 1989) 173.

[44] Howe, 492.

subordinate command, the Northwest African Air Forces, led by General Carl Spaatz.

The new organization brought an end to the air umbrellas offered by penny packets and placed renewed emphasis on air superiority as the best means to use air to protect Allied ground forces. Additionally, control over tactical units was centralized by a commander "fully conversant with their capabilities under varying military conditions."[45] The actions of the new organization under Tedder and Spaatz are an example of a joint approach to destroy Axis forces, as opposed to an attempt to promote independent and non-complementary air and ground strategies.[46] Additionally, the shared experiences of the British and American air forces during Operation TORCH provided the impetus for the publication of FM 100-20, *Command and Employment of Air Power* in 1943 which centralized control of air assets under a single air commander and made that air power separate and co-equal with land power.[47]

The skies over the deserts in North Africa were a laboratory in which the Allies reaped the benefits of adjusting logistics systems and relationships between air and ground forces without having to face either the best *Luftwaffe* units or a large number of Axis aircraft. Similar experimentation occurred with equipment, particularly pursuit aircraft. American pursuit aircraft operated in roles that did not match their designed functions. The reasons for this included the need for a battlefield capability that was not available in sufficient capacity and, more often, the aircraft's limitations, which forced adjustments in mission to make them more useful.

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[45] Howe, 493.

[46] Horst Boog, ed., *Conduct of the Air War in the Second World* War (New York, NY: Berg, 1992) 248.

[47] (I) Boog, 461. (II) FM 100-20. *Command and Employment of Air Power*, 21 July 1943.

American Pursuit Takes On Axis Fighters

The predominant foes that American pursuit aircraft faced in aerial combat were the Messerschmitt Bf109 and the Focke-Wulfe (FW) 190. The Bf109 enjoyed several advantages over its American counterparts. Outstanding performance, particularly below 15,000 ft, the use of cannon, which did not decrease in effectiveness with greater range to the same degree as most machine guns, and the use of tactics developed and matured during the Spanish Civil War and the various campaigns since 1939 gave Bf109 pilots significant advantages. Additionally, the ease of maintenance designed into the Bf109 resulted in greater operational availability potential than other, similarly complex aircraft.[48]

Both the Bf109 and FW 190 were a serious concern for Allied fighter pilots. For those flying the P-39 and P-40, the adversary was able to fly higher and faster, resulting in susceptibility to attack from above and follow-up attacks from below as the German fighters could quickly regain lost altitude. At least one fighter commander viewed the Bf109 and FW 190 ability to out-climb many American fighters as the aircrafts' greatest advantage.[49]

However, each of the American pursuit aircraft used in Operation TORCH had some characteristic its pilots turned to their advantage. In the case of the P-40, airframe ruggedness afforded pilots an extra measure of survivability as it could take more punishment from the adversary.[50] Additionally, the Warhawk could turn better than the

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[48] John F. Giulmartin, Jr. "The Aircraft That Decided World War II: Aeronautical Engineering and Grand Strategy, 1939-1945, the American Dimension" In *Winged Crusade: The Quest for American Air and Space Power*, edited by Michael Robert Terry, 111-150 (Chicago, IL: Imprint Publications, 2006) 117-8

[49] Kelly, 125.

[50] Peter Bowers, *Curtiss Aircraft: 1907-1947* (London, England: Putnam & Company Ltd., 1979) 478.

German fighters, a characteristic considered its greatest advantage.[51] However, these benefits came at a cost.

The P-40's ruggedness was mainly attributed to its weight, which in turn affected climb performance. Curtiss attempted to respond to pilot concerns about the Bf109 and FW 190 by removing two of six machine guns and a small fuel tank to achieve a loss in weight and gains in maneuverability.[52] Even those changes came at a cost. Lighter armament reduced the P-40's lethality when compared to the same duration of a burst from the German fighters' guns. The removal of the fuel tank exacerbated the issue of the Warhawk's already-short range. Perhaps the most useful attempt to achieve advantage with this aircraft was through improved tactics.

P-40 pilots learned to take on German fighters, particularly the Bf109, at advantageous altitudes. Specifically, the P-40 was more evenly matched against the Bf109 at lower altitudes.[53] The P-40s in one fighter group preferred an altitude of 8,000 ft above ground level in order to avoid small-arms fire from the ground and yet be low enough to prevent Bf109 attacks from above, which might also allow them to use the split-S maneuver to get position on a Warhawk's tail.[54]

The P-40 was used in its designed role as a defensive fighter, particularly for airfield defense against unescorted German bombers.[55] The Warhawk was also used to support ground forces as well. What Curtiss designers may not have been able to foretell was the P-40's use in an escort role. As early as December 1942, the Warhawk began escorting bombers to their targets.[56] Later, American commanders

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[51] Kelly, 126.
[52] Kelly, 308.
[53] Bowers, 477.
[54] Ernest McDowell and William H. Ness *Checkered Clan: The 325th Fighter Group in North Africa and Italy* (Army Air Force Unit History, 1969) 16.
[55] Kelly, 126.
[56] Craven and Cate Vol. 2, 123.

attempted to use the P-40 in multiple roles on the same mission by tasking it to be both a fighter-bomber and an escort. However, the experiment proved to be a limited success as the extra weight of the 500 lb. bombs carried by the P-40s hindered their ability to keep up with the B-26 Marauder formation they were tasked to escort.[57]

Overall, the P-40 succeeded in Operation TORCH thanks in no small part to its availability. This provided flexibility that helped XII AF fulfill missions for which other aircraft were either not available or unable to fulfill, and judicious tactics permitted the P-40 to compete with adversary aircraft considered to be superior. The P-39 Airacobra, however, did not attain the same level of success.

The P-39 was a disappointment from the start. As mentioned in the previous chapter, the decision to produce the aircraft without a supercharger made the design available for production more quickly but severely downgraded performance. By the time Operation TORCH began, the P-39 was accumulating a combat record from actions in the Pacific. P-39s were considered inferior to Japanese fighter aircraft, yet the P-40s, which also faced criticism in comparisons to the Japanese Zero, were used to good effect.[58] Employment of the P-39 demanded reconsideration of its design advantages.

The P-39's participation in Operation TORCH began tenuously. Its arrival into theater was delayed not only due to limited capacity to prepare the aircraft for combat but also based on its inability to traverse the ferry route due to unfavorable winds.[59] Even upon its arrival, air commanders were concerned about how to best employ the aircraft considering its value as a fighter was questionable at best.

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[57] McDowell, 18.

[58] (I) Bowers, 477. (II) Craven and Cate Vol. 2, 60.

[59] Craven and Cate Vol. 2, 60.

In the end, the P-39, originally designed as an interceptor, was used mostly for ground attack and reconnaissance.[60] The nose-mounted cannon was its defining characteristic in combat, and pilots put it to good use in strafing the enemy. However, the P-39 could not defend itself as well as other aircraft in the pursuit fleet, and it was typically employed with a fighter escort.[61] In rare cases, the P-39 was called upon to do the mission for which it was designed. Such was the case in May 1943 when P-39s scrambled to attack nearby Axis aircraft. The Airacobra demonstrated its weakness as an interceptor through its inability to reach the Axis reconnaissance aircraft flying above its service ceiling.[62]

The P-39's limited but real successes are a testament to the air commanders who sought to find maximum benefit in the aircraft available to them. Unable to use the P-39 effectively as a fighter due mostly to its altitude limitations, XII AF employed the Airacobra against ground targets. In doing so, it removed the design's greatest operational limitation of altitude and capitalized on the firepower available from the 37-mm cannon. While the P-39's missions were tailored due to what it could not do well, the P-38 saw mission growth because of the capabilities it provided and in which it excelled.

Like the P-39, the P-38 Lightning had already participated in combat in the Pacific and was making a reputation for itself. Widely considered as a superior fighter in comparison to Japanese models, the extra measure of safety offered by its twin engines and the advantage of longer range endeared the P-38 to American airmen in long flights over

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[60] Craven and Cate Vol. 2, 141.

[61] Mark Syrett "Northwest Africa." In *Case Studies in the Achievement of Air Superiority*, edited by Benjamin Franklin Cooling, 223-269 (Washington D.C.: Air Force History and Museums Program, 1994) 240.

[62] Craven and Cate Vol. 2, 186.

water and foreboding jungle terrain.[63] In the Mediterranean theater, the P-38 faced a different adversary with different tactics, which prevented the same measure of success the Lightning achieved in the Pacific. The P-38 was designed for high-altitude interception, yet German fighter tactics in North Africa forced it to fight at altitudes around 15,000 ft., a height at which German fighters retained the upper hand.[64] Additionally, the P-38's twin engines had an adverse effect on its maneuverability, a trait not nearly as important when the aircraft was employed as designed against high-altitude bombers, but a serious one when facing single-engine German fighters. Even the P-38's interceptor role suffered due to its lack of an on-board radar, a condition replicated in most fighter aircraft at the time and exacerbated by the limited availability of radar in the early months of the North African campaign.[65]

Nonetheless, P-38s were at a premium during Operation TORCH due to their long range and ability to function in multiple roles.[66] The Lightning competed favorably in air-to-air contests against the Bf109 and the FW 190 and could run from a fight its pilot did not wish to press.[67] Besides engaging enemy fighters, the P-38 intercepted enemy bombers, strafed ground targets, performed reconnaissance missions, conducted anti-shipping operations with light bombers, and escorted heavy bombers. The Lightning's versatility is all the more amazing considering it was available in smaller quantities than the P-40 but tasked to perform in more roles. In the final assessment, the versatility of the P-38 may have limited its success in that its use at lower altitudes in support roles

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[63] René Francillon, *Lockheed Aircraft Since 1913* (Annapolis, MD: Naval Institute Press, 1987) 179.
[64] William Green, *Famous Fighters of the Second World War* (Garden City, NY: Doubleday & Co, 1975) 27.
[65] Craven and Cate Vol. 2, 85, 127, 169.
[66] Craven and Cate Vol. 2, 130.
[67] Craven and Cate Vol. 2, 134.

did not exploit the advantages the aircraft offered, but it was nonetheless a vital AAF asset.[68]

Escort Fighter

The value of an escort fighter was clear prior to World War II, but as previously mentioned, pursuit aviation advocates believed the performance of fighter aircraft at the time prevented the realization of the idea. With a focus on other roles for pursuit aviation, the escort mission did not receive attention in the interwar years commensurate with its need. Additionally, the belief in a robust, self-defending bomber deluded many into downplaying the necessity for escort. Operations in the Mediterranean theater provided evidence of a need for escort fighters.

Pursuit aircraft escorted attack and light bomber aircraft in the North African campaign routinely, but those actions alone did not make a case for escort fighters. The proponents of strategic bombardment believed the speed and firepower of four-engine, heavily-armed bombers would provide for their own defense. However, the benefits of fighter escort for strategic bombardment could easily have been extrapolated from observation of low loss rates due to escort of other aircraft.

P-38s began escorting B-17 Flying Fortress formations as early as December 1942. The low loss rate for these bomber formations was attributed to the fighter escort even in the face of the appearance in larger numbers of the FW 190.[69] XII AF placed such value in escort operations that it took the unprecedented step of attaching escort fighters to a bomber command and co-locating the aircraft to avoid a complicated rendezvous from multiple airbases.[70]

Perhaps the best testament to the value of fighter escort is the impact of its absence on American bomber crews. An example from 27

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[68] Guilmartin, 135.
[69] Craven and Cate Vol. 2, 121
[70] Craven and Cate Vol. 2, 122.

January 1943 illustrates the point. A formation of four B-26s was prepared to attack an Axis naval convoy but was deterred due to a number of German fighters guarding the vessels. The P-38s assigned to escort the B-26s could not rendezvous with the formation, so the bombers aborted the attack.[71] The B-26 pilots' actions were based on their experience of the lethality of German fighters. Having benefitted in the past from escort operations, they assessed a low probability of mission success and returned home.

As Operation TORCH concluded and Allied forces ejected the Axis from Tunisia, employment concepts for pursuit aircraft continued to mature. While little could be done to change existing designs beyond minor modifications, newer aircraft designs, such as the P-51 Mustang and P-47 Thunderbolt, began to roll off the production lines. The AAF's experience taking on the German *Luftwaffe* and Italian *Regia Aeronautica* over North Africa taught it important lessons on how to use the aircraft it had as well as how to get the most from its future designs.

[71] Craven and Cate Vol. 2, 148.

Conclusion

Operation TORCH and the North African campaign provided American pursuit aircraft their first opportunity to engage Axis forces as part of a joint and combined team. Lessons learned in the desert had a positive impact on Allied performance for the rest of the war. In some cases, the lessons took hold immediately. Other lessons took longer to internalize.

Doctrinally, competing perspectives about the use of pursuit aircraft and other forms of aviation to support ground forces led to conflict about the most effective use of airpower. Under an RAF commander and using a British model for ground support, American airpower shifted to more centralized control. This model provided the impetus and practical foundation for its codification in FM 100-20 in July 1943. Centralized control of air assets remains a key tenet of the United States Air Force to this day.

The North African campaign also demonstrated the benefit of using pursuit aircraft to escort bombardment aviation. While they often supported light and medium bombers, as well as less-capable fighters flying ground-attack missions, pursuit aircraft also safeguarded heavy bombers conducting strategic attacks. The use of escort fighters, in general, was credited with decreasing bomber losses. This lesson was not applied in the European theater until January 1944, to the detriment of the planes and crews conducting long-range bombardment. This serious failing had two primary causes.

First, the need for long-range escort fighters was not universally accepted in the AAF. As bombers developed in the 1930s, proponents argued that speed would save them from enemy fighters. As pursuit aviation closed the performance gap, bomber advocates responded to the rising threat by investing in stronger armament and close formations for self-defense.

The second reason escort fighters were not more widely used was the lack of a long-range capability. Pursuit aviation courses at ACTS noted the deficiency in capability on the eve of World War II, but many saw no feasible options for providing that capability. The P-38, with the longest range of any operational American pursuit aircraft at the outset of Operation TORCH, demonstrated the benefits of long-range escort over the African desert, but the Lightning was not well received in the European theater due to its poor performance when engaged against single-engine German fighters.

Allied actions in North Africa also helped expand the role of pursuit aviation in conducting ground attack. The AAF experimented with using light bombs on pursuit aircraft in Operation TORCH, providing more robust attack capability but retaining the speed and maneuverability of a fighter aircraft. The Army's air arm initially resisted this new role for these aircraft.

As late as 1941, the Army Air Corps Plans Division rejected any plan to modify current fighters to better perform the ground support role.[72] This included the addition of bomb racks on pursuit aircraft. The Air Corps did make a conciliatory gesture to allay criticism by modifying early production P-51s with dive brakes and bomb racks. This variant of the aircraft was designated the A-36 for its expected attack role, but the plane's performance was mediocre.[73] It was not until March 1943 at a conference at Wright Field that the AAF more formally decided to use fighter aircraft in a multi-purpose role that included work as a fighter-bomber.

The North African campaign provided early evidence of the feasibility and success of using pursuit aircraft as fighter-bombers. P-40s attacked ground targets with 500 lb. bombs, and P-39s were all

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[72] William Wolf *American Fighter-Bombers in World War II: USAAF Jabos in the MTO and ETO* (Atglen, PA: Schiffer Military History, 2003) 13.
[73] Wolf, 13,33.

but dedicated to conducting ground attack. The versatile P-38 was also used early on for ground attack missions, presaging its eventual use as a fighter-bomber in the latter years of the war. The use of pursuit aircraft in the fighter-bomber role offered flexibility in that they could achieve the vital prerequisite—air superiority—early in an engagement, they could attack multiple targets by both strafing and bombing, their speed offered the advantage of surprise not available from even light bomber formations, and they could respond dynamically to changes in the operational environment much better than other aircraft types.[74] Hermann Goering, head of the *Luftwaffe*, suggested that the fighter-bomber, whose use became prolific in the Mediterranean theater, was the weapon that helped eventually win the air war in Europe.[75]

The skies over North Africa served as a proving ground for the available types of pursuit aircraft for a more hotly contested fight with the *Luftwaffe* over Europe. Of the three American pursuit designs used in Operation TORCH, only the P-38 saw more widespread use in the European theater, whereas all were employed widely in the Pacific. Figures 11 – 13 show the aircraft inventories of P-38s, P-39s, and P-40s, respectively, in the Mediterranean, European, and Pacific Theaters of Operations.

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[74] Wolf, 33.

[75] Martin P. Claussen, *Materiel Research and Development in the Army Air Arm, 1914-1945*. USAF Historical Study 50. Washington D.C.: AAF Historical Office, Headquarters, Army Air Force, November 1946), 197.

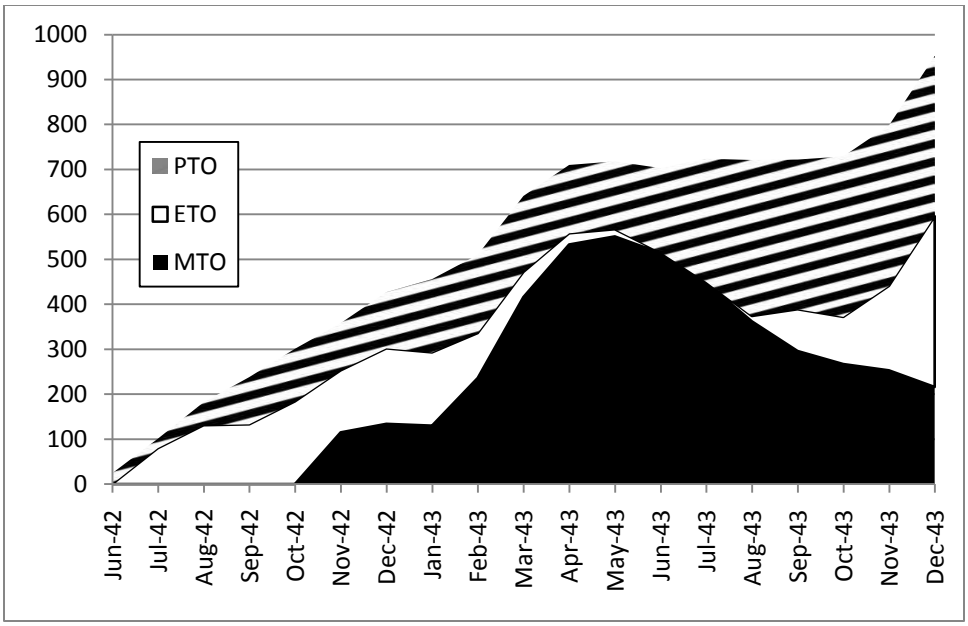

Figure 11: P-38 Inventory In Active Theaters

Adapted from AAF Statistical Digest: World War II, December 1945, Tables 89, 90, 91.

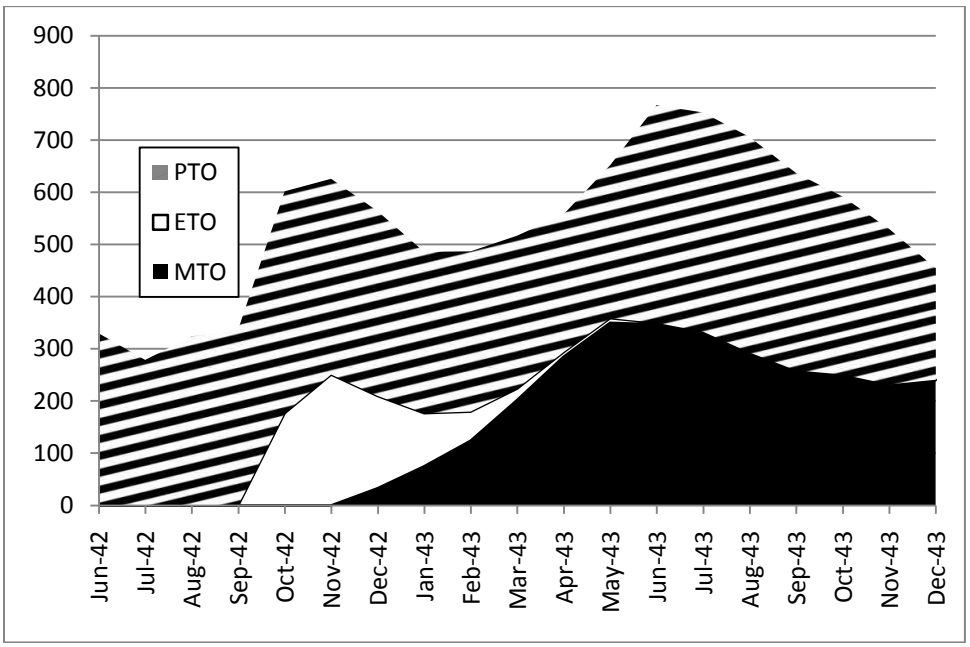

Figure 12: P-39 Inventory In Active Theaters

Adapted from AAF Statistical Digest: World War II, December 1945, Tables 89, 90, 91.

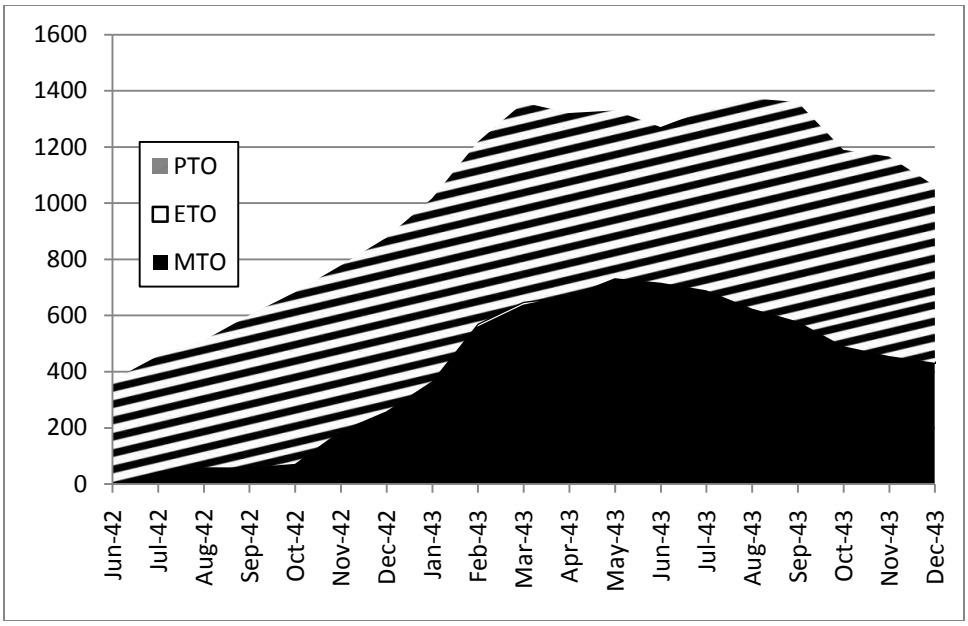

Figure 13: P-40 Inventory In Active Theaters

Adapted from AAF Statistical Digest: World War II, December 1945, Tables 89, 90, 91.

These figures highlight several trends mentioned in previous chapters. For one, the P-40's availability made it useful not only in the Mediterranean but also in the Pacific. Its presence in the MTO prior to the start of Operation TORCH reflects the aircraft's service with the IX AF and the RAF Desert Air Force. One may conclude that the inventory curve would have risen more steeply with the onset of operations in North Africa had aircraft delivery, infrastructure support, and supply and maintenance capacities been more favorable. The consistently high inventory of Warhawks in the MTO suggests the value the design brought to air commanders.

The P-40 design worked well for the British and American air forces in Operation TORCH. As evidence, they adapted its tactics and, through modifications, the aircraft itself to extract more capability from the basic aircraft. However, the P-40 was not considered suitable for the high-altitude operations characteristic of the European theater. A military review of aircraft performance in 1942 reached this conclusion

and suggested the P-40 could best be used elsewhere. Similar comments abounded regarding the P-39.[76]

The P-39 met a less favorable but still useful fate. The disparity in Airacobra inventory from other pursuit models early in the North African campaign reflected the delay in getting the aircraft to theater. The decrease in P-39 inventory in the ETO coincides with the creation of a niche for the aircraft in low-altitude attack of ground targets, a mission less useful to the ETO until later in the war, by which time more capable fighter-bombers were available. Nonetheless, the P-39 continued to serve in the Pacific and MTO. Additionally, the Russians found great utility in the P-39's ability to attack ground targets. This explains why the American aircraft industry continued to produce this aircraft even as its use by American airmen declined.

While the P-38 received due credit in the Pacific theater, it was less appreciated in the ETO. For one, an inadequate cockpit heater and the fuel/air mixture cooling in cold, moist conditions led to an early belief that the P-38 was not suited for the ETO.[77] Also, by the time the importance of long-range escort was clear in the ETO, other aircraft were available to perform the mission.[78] The decrease in P-38 inventory in the ETO as Operation TORCH started highlights the transfer of VIII AF squadrons to the MTO to support the North African campaign. Surprisingly, the MTO employed more P-38s at any one time than any other theater, including the Pacific. The aircraft's versatility, range, and speed help explain its prevalence in the theater. It was the most complete pursuit package available at the time to accomplish both expected and emerging missions.

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[76] *Report on Performance of American Military and Naval Aircraft* (Washington, D.C.: Office of War Information, October 19, 1942) 8.
[77] Guilmartin, 135.
[78] Guilmartin, 134.

The Office of War Information offered additional assessments about the condition of pursuit aviation on the eve of Operation TORCH. In its report, the agency highlighted that the Allison liquid-cooled engine was the most advanced, highest-performing engine available to aircraft manufacturers at the time, but the engine was not as mature as British and German models.[79] The report went on to note that the Allison engine mated to a supercharger, as was found on the P-38, provided "splendid service performance."[80]

Of course, the Allison engine would not have performed as well without the use of higher octane fuels, a luxury not afforded the *Luftwaffe*. One comparison of engine performance between American and German fighters concluded that German aircraft burning the readily available 87 octane fuel would require 25 percent greater engine displacement to match the performance of some Allied fighters using 100 octane fuel. German attempts to raise their fuels' octane ratings met with little success due to the additional processing's effect on fuel availability and the damaging effects of the synthetic additives to other engine components.[81] Hence, Doolittle's advocacy for higher octane fuels offered the Allies a way to compete with more mature engine designs.

The report's most insightful remarks concerned aircraft design in preparation for war. German and Japanese relative design superiority resulted from the fact that both countries knew exactly what they wanted their aircraft to do. The United States, on the other hand, was not able to predict what would be asked of its air forces. The United States' defensive posture before World War II was a function of the belief that adversaries could not reach its borders, along with policy makers' and

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[79] *Report on Performance of American Military and Naval Aircraft* (Washington, D.C.: Office of War Information, October 19, 1942) 12.
[80] *Report on Performance of American Military and Naval Aircraft* (Washington, D.C.: Office of War Information, October 19, 1942) 15.
[81] Stephen McFarland and Wesley Newton, *To Command the Sky: The Battle for Air Superiority Over Germany, 1942-1944* (Washington D.C.: Smithsonian Institution Press, 1991) 58.

planners' inabilities—and in some cases unwillingness—to foresee combat on foreign soil.[82] Our Air Force faces many of these same issues today.

Regarding our Air Force in 2010, what kinds of analogous comparisons can we draw from the United States' experiences with pursuit aircraft in the interwar years and through Operation TORCH? Today's policy makers and planners, after filtering the TORCH experience for contextual factors, should be concerned with the condition of aircraft acquisition programs and America's industrial capacity.

The American mindset is not quite as defensive as the years before World War II. The war destroyed the false sense of security that vast oceans once provided. Iterations of the National Security Strategy now advocate for engagement across the globe, and global power projection remains a practice of the US political-military establishment. United States involvement in conflicts that do not represent the same, immediate, existential threat as the Axis Powers provides an indication of American willingness to commit forces-a change from interwar attitudes.

The acquisition timeline has also changed. In the 1930s, an aircraft design could be expected to take approximately five years to progress from conception to operational capability. Today, a new aircraft design, born from unique specifications as opposed to a commercial derivative, may take upwards of two decades to come to fruition.[83] This trend is unlikely to change as successive generations of fighter aircraft are more complex than their predecessors.

Related to the acquisition process is the industrial base. In 1925, the Morrow Board recognized the need to maintain a capability for

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[82] *Report on Performance of American Military and Naval Aircraft* (Washington, D.C.: Office of War Information, October 19, 1942) 16.

[83] The idea for an Advanced Tactical Fighter, which would later evolve into the F-22, was socialized in the 1980s. After soliciting for prototypes, selecting the source for manufacture, performing engineering and development, conducting operational testing, and manufacturing, the F-22 was not operational until well into the 2000s.

aircraft production through contracting for a level supply of aircraft. In such a way, the industrial base would not be subject to peaks and valleys in aircraft orders that would otherwise make it difficult for manufacturers to sustain the employment of skilled workers. Today, the order quantities for military aircraft are even more sporadic and smaller.[84] When the contracted order is delivered, there is not necessarily, and in fact not usually, a follow-on contract for airframe manufacturers to keep skilled and specialized workers employed.

Closing a production line can have long-lasting or permanent effects on a nation's ability to restore fleet strength in the event of aircraft losses. During World War II, active production lines provided replacements for aircraft lost to accidents and combat. Once modern manufacturing lines are closed, there is little chance of quickly restoring production capacity. If it were possible to restore a production line, the nation would pay a premium so the company could re-hire employees who have found other work or overcome a large training bill to overcome the new employees' learning curve. The US Air Force has taken a hedging approach to this situation in the form of an attrition reserve, whereby an aircraft fleet is augmented with an additional number to replace losses. The key question is, simply, "What does the nation plan to do when the attrition reserve is used up?"

Former Secretary of Defense Donald Rumsfeld famously remarked that, "you go to war with the Army you have."[85] His statement was as true before World War II as it is today. However, the United States before World War II had two advantages it does not currently enjoy. First, the Baker Board in 1934 suggested that the United States should use

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[84] The fleet purchase for the F-22 will be below 200 units, and there is no replacement planned after its manufacture is complete. The closing of the F-22 line will eliminate the need for the skilled workers employed for the aircraft's manufacture and places the retention of those skills at risk as the workers seek other employment not necessarily related to their skill.

[85] Thomas Ricks. "Rumsfeld Gets Earful from Troops." *The Washington Post*, 9 December 2004.

existing facilities and resources at the outbreak of war and expand production to meet war demands. The specialization and lack of excess capacity in the industrial base today reduces opportunities for a quick adjustment to wartime demands should they suddenly arise. Secondly, the United States had several years to prepare for its entry into World War II. If President Roosevelt is considered to have provided the impetus for the buildup of the armed forces in the latter part of 1938, the military had three years to prepare before the attack on Pearl Harbor. This was nearly enough time to create a pursuit aircraft designed for the expected conflict. In today's acquisition environment, a decision in 2010 to field a new fighter aircraft specifically designed for the next conflict would mean actual preparedness to face a belligerent in approximately 2030!

Pursuit aviation in the United States began World War II at a disadvantage. The nation's defensive-mindedness created biased perceptions of what the Air Corps needed in a pursuit aircraft. The quest for air force independence through strategic bombing robbed other aviation types of valuable resources and development efforts in the lean interwar years. Further, acquisition methods incentivized by influential review boards encouraged delays in the procurement of state of the art technologies. When the time for war approached, the aircraft industry was slow to convert to a wartime footing and was encouraged to produce quantity over quality. American pursuit aviation needed to catch up not only in technology but in doctrine and employment concepts as well. In contrast, today's Air Force places a greater emphasis on quality.[86] What remains to be seen is whether or not acquisition decisions in light of the current state of the American aviation industry and the American proclivity to resort to force will allow the Air Force to keep up and ultimately triumph in times of conflict in the face of a determined enemy, as it did in World War II.

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[86] Clint Hinote *Centralized Control and Decentralized Execution: A Catchphrase in Crisis?* (Maxwell AFB, AL: Air Force Research Institute, March 2009) 14.

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